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Comparative Economic Advantage of Crop Production in Zimbabwe

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Foreword

Southern Africa was characterized by a heavily regulated agricultural market before the late 1980s but, since then, countries in the region have followed a strategy to remove restrictive measures from the agriculture sector. The deregulation process has taken place within the context of worldwide liberalization of agriculture. These changes have meant that Zimbabwe, and the entire southern Africa region, has to compete internationally in a more open agricultural market. In order to be competitive, southern African countries have to use resources more efficiently by exploiting their comparative advantages. Policy and decision-makers should be guided so as to implement policies and strategies that will enhance the competitiveness of agricultural producers.

Various studies have shown that countries can improve their welfare by opening up their borders to freer trade. There is, furthermore, a worldwide move toward economic integration; the European Union probably being the most prominent example. Southern Africa is no exception with the region's move toward a Free Trade Area under the auspices of the Southern African Development Community (SADC). Not only is it foreseen that this movement will improve welfare in the whole region, but the region's competitiveness could also improve. Within the framework of economic integration in southern Africa, countries will only reap the benefits by exploiting comparative advantages that may exist within the region.

Zimbabwe is one of seven countries in the SADC participating in the Research Program on Regional Agricultural Trade and Changing Comparative Advantage in Southern Africa. The comparative economic analysis (CEA) study in Zimbabwe forms part of a larger activity to determine comparative advantages in the region. These studies not only examine the existing comparative advantages, but also provide a means to evaluate the impact of different agricultural policies on comparative advantage. This proves to be an especially valuable tool to guide policymakers in the region.

Comparative economic analysis establishes that groundnuts and sunflower are competitive in Zimbabwe's large and small scale commercial sectors, as well as the communal sector. It also reveals that maize is competitive in only two of the five agroecological zones, despite the subsidization and emphasis on maize production. Drawing from these results, the study's authors examine the potential implications of the study's findings on policy and identify taxation of the agricultural sector as one area requiring further attention. Cash crops in Zimbabwe are heavily taxed yet it appears that only a small percent of the revenues are ploughed back into the agricultural sector in the form of research, development, and institutional support.

This study is one in a series of studies on Africa's regional trade and comparative advantage, a joint activity of USAID Africa Bureau's Office of Sustainable Development, Agriculture, Natural Resources and Rural Enterprise (ANRE) Division and the Regional Economic Development Services Office for Eastern and Southern Africa (REDSO/ESA).

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U.S. Agency for International Development

Executive Summary

In 1986, the Southern Africa Development Committee (SADC) first approved the establishment of an intra-SADC trade promotion program to facilitate the exchange of preferences among member states. It was not until 1996, however, that the SADC Free Trade Protocol for the liberalization of intra-regional trade was agreed upon. The protocol opened the door for the realization of increased trade among southern African economies that have, in the past, been predominantly oriented toward exporting to the West and to South Africa.

The potential for expanded intra-regional trade of agricultural commodities does exist within the region – the critical question is how to realize it. One of the most important steps towards realizing this potential is to identify and exploit agricultural enterprises in which each member state has a comparative economic advantage (CEA). Specialization in the production of those commodities with a comparative advantage will result in increased productivity and improvement in the quality of life for many in the southern Africa region.

OBJECTIVES

This study is part of a series of seven country studies completed under the USAID-funded Research Program on Regional Agricultural Trade and Changing Comparative Advantage in Southern Africa. The broad objective of this study, and the larger research project, is to contribute toward the expansion of intra-regional trade in southern Africa. More specifically, this study focuses on Zimbabwe's trade in the region by providing a comprehensive analysis of the comparative economic advantage of alternative production systems in Zimbabwean agriculture. The study results are intended to inform policy- and decision-making in the areas of trade, efficiency in agricultural production and specialization by providing guidance on what agricultural commodities are cost effective to produce for the export market and in which parts of Zimbabwe they can be produced most efficiently.

BACKGROUND

Zimbabwe is land locked and mainly imports and exports through ports in South Africa and Mozambique. It has fairly effective road, rail and air networks that link it to international markets. Zimbabwe's agricultural exports have traditionally been dominated by tobacco, sugar, cotton, maize and beef. Recently, horticultural exports and coffee have gained significantly in importance. Zimbabwe's share of trade in the SADC region is only second to South Africa. About 27 percent of her global exports go to SADC countries and 43 percent of her total imports come from the region. South Africa is her dominant trading partner in the SADC region, followed by Botswana, Zambia, and Mozambique.

The Zimbabwean agricultural sector is characterized by two major farming systems: the 1.3 million smallholder farmers occupying a total of 21 million hectares of land and the 4,000 large scale commercial farmers occupying about 11 million acres of land. Generally, the large scale sector is well-developed, utilizes modern technologies, is highly mechanized, and is mainly located in high potential areas. The smallholder sector is predominantly resource poor, largely subsistence, located in low potential areas where land ownership is usually communal (with the exception of the small commercial sector). Smallholder farmers produce and market the bulk of maize (55 percent), cotton (70 percent), sunflower (85 percent) and millets. A large proportion of the remaining crops are produced by the large scale sector, including 90 to 99

percent of all marketed flue-cured tobacco, soyabeans, sugar, coffee and export horticultural crops.

More than 70 percent of Zimbabwe is pastoral land suited to the raising of livestock. The livestock industry includes the production of cattle and milk and, to a lesser extent, pigs, poultry, sheep and goats.

APPROACH AND METHODS

To evaluate the competitiveness of different geographic areas and farming systems in producing a variety of agricultural commodities, this study utilizes the domestic resource cost (DRC) ratio approach that compares the economic costs of domestic resources to the economic value added by a production activity. If the country can gain by producing locally for export, with outputs and inputs valued at their opportunity cost, then it is competitive internationally in the production of the commodity.

In the course of coming up with competitiveness measures for various agricultural commodities, various distortions inherent to the agricultural industry of Zimbabwe are revealed. These distortions, and their impact on the Zimbabwe economy, are viewed by using the policy analysis matrix (PAM) elaborated by Monke and Pearson (1989). PAM defines profitability as the difference between revenue and costs and measures the effects of government intervention or distortions as the difference between observed parameters and parameters that would exist if the distortions were removed. By filling in the elements of the PAM for agricultural activities, an analyst can measure both the extent of policy effects and the inherent economic efficiency (or comparative advantage) of the activity.

SUMMARY AND CONCLUSIONS

By measuring the private and social profitability, resource cost ratios, and sensitivity to world prices and yields of different crops produced by the various farming system sectors in the five agroecological zones in Zimbabwe, determinations were made as to which regions are economically suitable for the production of particular crops. In the large scale commercial sector, the findings indicate that the most competitive crop is groundnuts, which ranks first in zones 1, 2, and 3 and second in zone 4. Ranked relatively low in zone 1, sunflower and Virginia tobacco become relatively more competitive in drier ecological zones. Maize, despite taking the lion's share of cultivated land, is only competitive in zones 1 and 2 where it ranks last in its efficiency in using domestic resources. These findings indicate that the emphasis on maize production may not be warranted and that removal of maize subsidies would boost the production of other crops.

In the small scale commercial sector only three crops – groundnuts, sunflower and maize – were found to be competitive based on average farmer practices. However, the study results reveal that, compared to the other sectors, a higher number of crops are economically viable in each zone in the small scale commercial sector. The most efficient crop in the communal sector was groundnuts, followed by sunflower, finger miller and cotton in all zones.

The assessment of policy intervention effects resulted in the identification and quantification of the effects of government policies on the production of individual crops. Of particular note among the overall policy effect findings was that only a small share of agriculture tax revenue is re-invested into agricultural sector support institutions such as research and extension. The results also indicate that the pan-territorial pricing system that has been in place for decades has created severe distortions through net subsidization of farmers in regions remote from main consumption centers. The government's current policy of setting only floor prices still has its flaws as these prices may still be more than efficiency prices in very remote areas. In addition, liberalization has put the whole burden of subsidy on the government and has removed some cross subsidization possibilities.

Glossary of Acronyms and Abbreviations

AFC	Agricultural Finance Corporation
CFU	Commercial Farmer's Union
CMB	Cotton Marketing Board
COM	Communal Sector
COMESA	Common Market for Eastern and Southern Africa
CSO	Central Statistical Offices
DRC	Domestic Resource Cost
EPC	Effective Protection Coefficients
ERP	Economic Reform Program
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GMB	Grain Marketing Board
IMF	International Monetary Fund
LSC	Large Scale Commercial
NPC	Nominal Protection Coefficients
PAM	Policy Analysis Matrix
RCR	Resource Cost Ratios
SADC	Southern Africa Development Committee
SGR	Strategic Grain Reserve
SSC	Small Scale Commercial
TMB	Tobacco Marketing Board
UDI	Unilateral Declaration of Independence
US$	United States dollars
WTO	World Trade Organization
Z$	Zimbabwean dollars
ZIMACE	Zimbabwe Agricultural Commodity Exchange

1. Introduction and Background

Historically, trade patterns in southern Africa were developed toward South Africa, Europe and North America. Within the region, however, there has been relatively low volumes of trade. Initially, the Southern Africa Development Committee (SADC) followed a step-by-step planned integration of its economies: first at the production level, then followed by exchange. There was less emphasis on trade creation as a part of economic integration. Increasing production was regarded as primary while expanding intra-regional exchange was secondary. Issues of comparative advantage were not even raised. For the first 12 years (1980 to 1992) increasing intra-regional trade was not on SADC's agenda. The focus was on improvement of food security for each member state. It is therefore not surprising that over 90 percent of exports from all SADC countries (excluding South Africa) go to the West and South Africa. A similar percentage of imports into the region come from the West and South Africa. A few countries dominate intra-regional trade because of the relative strengths of their economies. South Africa aside, Zimbabwe accounts for more than 40 percent of total SADC trade, followed by Zambia and Botswana which account for about 16 percent each. The volume of trade with the rest of the world constitutes a large proportion of the total trade for these countries. Like most African countries, the dominant exports from the southern Africa region (excluding South Africa) are primary commodities from the agricultural and mining sectors. Some view traded commodities in the region as not being complimentary and suggest that the relatively low volumes of trade in the region are due to similarities in commodities (Saasa, 1997).

1.1 WHY REGIONAL TRADE?

Arguments for strengthening intra-regional cooperation have ranged from enlargement of markets and exploiting scale economies to reduction of dependence on dominant countries while strengthening the bargaining position of smaller economies. Both these arguments apply to the SADC region whose countries have relatively small populations ranging from less than

Table 1.1 Populations of SADC Member Countries

Country	Population (Million)*	Growth Rate (percent)
Angola	11.09	3.1
Botswana	1.48	2.6
Lesotho	2.02	2.2
Malawi	10.01	2.8
Mauritius	1.14	1.3
Mozambique	16.58	2.5
Namibia	1.58	2.7
South Africa	42.38	2.3
Swaziland	0.92	2.6
Tanzania	30.49	3.1
Democratic Republic of Congo	45.35	3.3
Zambia	9.18	2.8
Zimbabwe	11.21	2.5

*1996 figures

Source: The World Bank, *African Development Indicators*, Washington, D.C., 1997.

two million to over forty-five million. Of the 13 SADC member countries, only four have populations above fifteen million and five have populations of two million or less. (Table 1.1) Domestic markets in these countries are too small to support the development of modern economies. Regional cooperation allows these countries to specialize in production and export to nearby markets incurring lower transaction costs, including transport. Intra-regional trade allows food consumption by households to exceed food production in those countries with low output. Unrestricted cross-border trade in the region will thus lead to increases in regional output in response to demand from food deficit countries. Through imports from the region, food deficient countries are able to meet their food demand. In addition, such trade increases the assortment of food commodities available and create employment in those areas with expanded agricultural production.

One of SADC's objectives is to:

> promote self-sustaining development on the basis of collective self-reliance and the interdependence of member states. (Chitiga, 1997, 2)

By promoting the above development, the SADC reduces the effects of external shocks and minimizes fluctuations in the supply of products. It also reduces dependence on the West. Another of SADC's original objectives was:

> the reduction of economic dependence, particularly but not only, on the Republic of South Africa.

This objective reflected the fear of being dominated by large economies which could hold the smaller ones at ransom in the event of disagreements. Regional cooperation in this case placed the southern African countries in a stronger position both economically and politically against South Africa.

1.1.1 Existing Trade Arrangements in the Southern African Region

As indicated earlier, for the first 12 years of its existence SADC placed little emphasis on trade. Since most of the member states were also part of the Common Market for Eastern and Southern Africa (COMESA), the need for SADC protocols to include trade did not seem urgent. The existence of other multilateral and bilateral arrangements between member states also seemed to satisfy the needs of many. Currently, SADC member states belong to COMESA, SACU and bilateral arrangements. Angola, Tanzania, Lesotho, Malawi, Namibia, Mauritius, Swaziland, the Congo, Zambia and Zimbabwe belong to the COMESA while Botswana, Lesotho, Swaziland, Namibia and South Africa belong to SACU. In addition, Zimbabwe has bilateral arrangements with South Africa, Botswana, Malawi and Namibia. South Africa also has bilateral arrangements with Mozambique, Malawi and Mauritius.

1.1.2 The SADC Trade Protocol

It was only in 1986 that SADC heads of state approved the establishment of an intra-SADC trade promotion program which facilitated the exchange of preferences among member states. The crucial breakthrough for SADC's trade was the agreement on the Free Trade Protocol which was reached in 1996. This protocol brought South Africa into a wider multilateral trade agreement. The protocol sets out the general framework for the liberalization of intra-regional trade. It provides for the eventual elimination of tariff and non-tariff barriers. The SADC trade arrangements also cover issues of cross border technology transfer, investment, money and finance which are all pertinent for increased economic integration.

1.1.3 Potential For Intra-Regional Trade in Agriculture

Exchange of agricultural commodities is not significant in the SADC region, yet almost all SADC countries export agricultural products. The commodity structure in SADC trade is dominated by the exchange of manufactured and semi-manufactured goods. Food imports are relatively high for most SADC, countries but the source of these food imports is not necessarily within the region.

Most SADC states depend on one to three commodities for a large share of their exports. Table 1.2 shows that tobacco dominates Malawi's exports accounting for 74 percent of the total, while prawns account for 37 percent of Mozambique's exports and tobacco accounts for 34 percent of Zimbabwe's

total export earnings. Only two percent of South Africa's total export earnings is accounted for by its main agricultural exports, fresh and dried fruits.

Saasa argues that intra-regional trade volumes in the SADC are low because of similar commodities are exported by many of the countries in the region. This argument is not fully supported by available data. (Table 1.3) There is still some potential for expanded intra-regional trade. An African Development Bank report which assessed South Africa's agricultural exports and imports by countries in eastern and southern Africa revealed some potential for trade. South Africa was found to be importing from the rest of the world 12 different agricultural commodities, namely, meat and meat products, fish and fish preparations, vegetables and fruit, sugar, coffee, tea and cocoa, tobacco, textile fibers, crude fertilizers, crude animal and vegetable materials, essential oils and leather. In the meantime, the same commodities are simultaneously being exported to the rest of the world by Zimbabwe, Angola, Kenya, Mauritius, Mozambique, Malawi, Tanzania and Zambia. Potential for expanded intra-regional trade does exist and the critical question is how to realize it. (ADB, 1993) One of the most important steps towards realizing this potential and exploiting opportunities for intra-regional trade is to identify and exploit agricultural enterprises in which each member state has a comparative advantage. Specialization in the production of those commodities with a comparative advantage will result in increased productivity and improvement in the quality of life for many people in the southern Africa region.

SADC member states are diverse in their agro-resources, i.e., climate, soils and agroecology. This provides them scope for specialization in a wide variety of products. The prime task for each country is to identify and exploit its natural advantages and produce those commodities in which they have a comparative economic advantage. This would improve productivity and opportunities for increased intra-regional trade.

Table 1.2 Principle Agricultural Exports of SADC States as a Percentage of Total Exports

Country	Agricultural Exports	% of Total Exports
Zimbabwe	Tobacco	34
	Cotton	3
	Sugar	6
Botswana	Meat products	5.3
Malawi	Tobacco	74
	Beverages	7
	Sugar	6
Mozambique	Food and crude materials	23
	Prawns	37
	Nuts	10
Namibia	Food and live animals	37
Swaziland	Food	38
Tanzania	Beverages	20
	Cotton	18
	Zoo animals	5
	Vegetables	8
South Africa	Fresh and dried fruits	2

1.2 OBJECTIVES OF THE STUDY

The broad objective of this study is to contribute toward the expansion of intra-regional trade in southern Africa with a focus on Zimbabwe's trade in the region. This study achieves this objective by providing a comprehensive analysis of the comparative economic advantage of alternative production systems in Zimbabwean agriculture. Results from this analysis inform policy- and decision-making in the areas of trade, efficiency in agricultural production and specialization. This study should provide guidance on what agricultural commodities are cost effective to produce for the export market and in which parts of Zimbabwe they can be produced most efficiently.

1.3 AN OVERVIEW OF THE ECONOMIC ENVIRONMENT

The country is land locked and mainly imports/exports through the ports of Beira/Maputo (Mozambique) and Durban/Port Elizabeth (South Africa). It has fairly effective road, rail and air networks which link it with international markets. The Zimbabwean economy is well diversified. The major components of the economy in 1995 (as reflected by the Gross Domestic Product) are listed in Table 1.3.

The most dominant agricultural products are maize, tobacco, cotton, sugar, beef, oilseeds, horticulture, coffee, groundnuts, beans and small grains. With the exception of wheat, barley and horticultural products, most crops are grown during the rainy season in the summer months between November and April.

1.3.2 Economic Performance

Zimbabwe has experienced considerable shifts in macroeconomic policy over the years. During the era of the Unilateral Declaration of Independence (UDI) between 1969 to 1979, economic policies were geared towards import substitution and strict central controls of prices, foreign exchange, interest rates etc. Most of these controls were continued after Independence in 1980 but considerable social progress was made in the areas of education, health and smallholder agriculture. Consequently, this had an adverse effect on economic growth as government expenditure grew. Droughts, especially during the 1986/87, 1991/92 and

Table 1.3 Economic Sub-Sectors and Contribution to GDP

	Z$ million (GDP at factor cost by industry of origin)
Agriculture and Forestry	4,004
Mining and Quarrying	2,739
Manufacturing	16,300
Electricity and Water	2,455
Construction	865
Finance and Insurance	1,226
Real Estate	747
Distribution, Hotels and Restaurants	4,357
Transport and Communication	2,125
Public Administration	902
Education	1,958
Health	521
Domestic Services	191
Other services	1,944
Less Banking Service Charges	559
GROSS DOMESTIC PRODUCT	39,775

Source: Central Statistical Office

Table 1.4 Economic indicators 1985 - 1995				
Year	GDP at factor cost (constant 1980)	% Growth Rate	Rate of Inflation	Foreign Exchange Rate*
1985	3,798			0.61
1986	3,881	2.0		0.59
1987	3,861	-0.5		0.60
1988	4,143	7.0		0.51
1989	4,332	4.6	15.5	0.44
1990	4,428	2.2	23.3	0.38
1991	4,568	3.0	42.1	5.05
1992	4,301	-6.0	27.6	5.48
1993	4,341	0.9	22.3	6.94
1994	4,661	7.4	22.5	8.39
1995				9.31

*Middle rates – spot transactions

Source: Central Statistical Office and Reserve Bank of Zimbabwe

Note: With effect from 6 September 1991, exchange rates reflect Zimbabwean dollars per Unites States dollar. Rates prior to this data reflect United States dollars per Zimbabwean dollar. The Zimbabwean dollar was devalued by some 35 percent in real terms during the first nine months of 1991, at the onset of reforms.

1992/93 seasons, compounded the problem. Table 1.4 gives details of the levels of GDP and other macroeconomic variables between 1985 and 1994, in 1980 prices.

The low economic growth in the 1980s could not keep up with population growth. Limited export growth, increase in the government's fiscal deficit and consequent central government debt, and low levels of growth in the productive sectors of the economy were major reasons for embarking on reforms in 1990 in a bid to stimulate economic growth through channeling resources to the productive sectors.

The key areas of adjustment under the Economic Reform Program (ERP) which the Government of Zimbabwe embarked on in 1990 focused on the following:

- Macroeconomic policy adjustment
- Trade liberalization and
- Deregulation (market and price)

The fundamental objective of reform in Zimbabwe was to improve the living conditions of the poorest groups through the generation of higher sustainable economic growth, which would result in increased real incomes and lower unemployment.

1.3.3 Growth targets

The overall economic growth target was put at five percent per annum; industrial growth 5.8 percent per annum, Agriculture 3.2 percent per annum and the service sector at five percent per annum. Investment was targeted to rise to 25 percent of GDP, up from 15 percent recorded in the mid-1980s. It was projected that by 1995 GDP per capita and consumption per capita would be rising by two percent per annum.

To date, most of the reform measurers the government undertook to implement during the first phase of ESAP, 1991 to 1995, have been implemented. The major outstanding area of concern has been the fiscal policies, as those relate to the reduction in the central government's budget deficit and related cuts in recurrent expenditure.

Most of the monetary policy reforms have been implemented. This implementation has resulted in the relaxation of controls on interest rates, leaving these to be determined more by market forces, while the government has moved to indirect controls of credit and money supply. The exchange rate policy has been revised to ensure that the currency moves with market forces. Prior to reforms, the Zimbabwean dollar was highly overvalued. As reflected in Table 1.4, the Zimbabwean dollar has largely been devalued to reflect near market levels.

1.4 REFORMS IN THE AGRICULTURAL SECTOR

Since the inception of the reforms in 1991, various policy changes have taken place within the agricultural sector. The specific key areas that have affected agriculture are:

i. Market and price deregulation,

ii. Trade liberalization,

iii. Public enterprise reform, and

iv. Fiscal and monetary reform.

1.4.1 Deregulation and Public Enterprise Reform

Prior to 1990, the system was highly regulated with prices and distribution centrally controlled.

Measures were designed to reform the regulatory system to increase competition and market opportunities through price and marketing decontrols. Agricultural price and marketing decontrol were designed to eliminate subsidies to parastatals. Monopolies in agricultural marketing were to be removed to allow other marketeers to participate.

Prior to the implementation of reforms, statutory control gave the monopoly of major food product marketing to parastatals. Grains and oilseeds were all marketed through the Grain Marketing Board (GMB), which was established in 1950. The Cold Storage Commission, which was set up in 1937, was given a large degree of control over the beef industry. For similar purposes the Dairy Marketing Board was established in 1952 with the sole responsibility of receiving and processing all raw milk from registered producers. Tobacco and horticultural products have been the only major products that were not marketed through a single channel system.

There have been numerous policy changes covering agricultural products since 1991. Market forces have been given a greater role in the allocation of scarce resources.

- Market monopolies have been removed and private players now participate in the marketing of agricultural products.
- All agricultural commodities are now sold to best advantage, with both producer and selling prices being market determined. However, with regard to maize, GMB has the responsibility of maintaining the Strategic Grain Reserve (SGR), but with the cost being borne by the government. The GMB also has a monopoly over maize imports and exports.

All former agricultural marketing parastatals (except GMB) were converted into companies registered under the Companies Act. They now operate in competition with other market players and are no longer required to carry out any social responsibilities, nor do they receive any subsidies from the central government. In fact, they now are required to pay dividends. Two of the former agricultural marketing parastatals, Dairiboard Zimbabwe, Ltd. (formerly, the Dairy Marketing Board) and the Cotton Company of Zimbabwe (formerly, the Cotton Marketing Board) have been doing so over the past two to three years.

The next stage in the reform of these former parastatals is privatization. The government has already approved the privatization of Dairiboard Zimbabwe, Ltd. and the Cotton Company of Zimbabwe. Shares were floated on the market and in both cases they were oversubscribed. Shareholders in these companies include the farmers (both large scale and smallholder), management and employees, technical partners or strategic investors, indigenous people and the government.

Although GMB has remained a parastatal, it does not receive subsides and has to operate commercially, except for carrying out the functions of maintaining the SGR, whose costs are met by the government.

1.4.2 Impact of Reforms on Marketing of Agricultural Products

Generally, the exchequer has been relieved of marketing subsidies to the agricultural sector.

a) Beef and livestock

- With the liberalization of the livestock sector, private abattoirs have been established and currently handle over 50 percent of all slaughtering. The Cold Storage Company now handles only about 40 percent of all cattle slaughtering. The only major control relates to compliance with veterinary service standards and regulations.
- Farmers now have alternative channels to dispose of their animals.
- Prices are determined by market supply and demand forces.

b) Grains and Oilseeds

- Domestic grain deregulation has increased disposal options for farmers to now enter into contracts directly with millers and oil expressors. Others do so through traders most of whom are registered with the Zimbabwe Agricultural Commodity Exchange (ZIMACE). The exchange was established around 1994 and handles any agricultural product or agriculture related product. The volume of trade through the exchange is steadily on the increase.
- Studies have shown that the number of hammer millers has increased by 101 percent in rural areas and 365 percent in urban areas between 1990 and 1995. These together with small scale commercial matters have taken a large proportion of the milling business.

c) Dairy Products

- Liberalization has resulted in increased market opportunities for farmers and more choices for consumers.
- There are now two main, privately-owned dairies that operate in competition with Dairiboard Zimbabwe, Ltd. for the supply of pasteurized milk and other dairy products in urban areas. In addition, manufacturing companies, like Nestle, now secure most of their requirements directly from producers.

1.5 THE STRUCTURE OF THE AGRICULTURAL SECTOR

Zimbabwe covers a total land area of 39.07 million hectares, of which about 85 percent is classified as agricultural, while 15 percent is reserved for national parks, wildlife and for urban areas. About seven percent of the agricultural land is cropped land while the balance is rangeland.

The existing land distribution pattern is as follows:

i) Approximately 4,000 large scale farmers on 11 million hectares.

ii) An estimated 1.3 million communal area farming families on 16.3 million hectares.

iii) About 10,000 small scale commercial farmers on 1.2 million hectare.

iv) 60,000 resettlement families on 3.3 million hectares.

v) Parastatal state farming sector on 0.5 million hectares.

1.5.1 Farming Systems

The main distinguishing characteristics of the farming community is the existence of two major subsectors based on size of land holdings, i.e., the larger group comprising about 1.3 million smallholder farmers occupying a total of 21 million hectares of land. The other group is comprised of large scale commercial farmers, numbering an estimated 4,000 and occupying about 11 million hectares of land.

Generally, the large scale sector is well-developed, utilizes modern technologies and is highly mechanized. Ownership of land is freehold and leasehold. The farm-

Table 1.5 Land Classification by Natural Regions and by Farming Sector

Natural Region % of Land in:	Smallholder Sector			Large-Scale Sector	
	Communal	Resettlement	Small-scale commercial	Large-scale (private)	Parastatal state
I and II	9	193,843	19	35	4
III	17		35	22	32
IV and V	74		46	43	64

Source: Ministry of Agriculture (1996)

ing sector is fairly intensive as they are mainly located in high potential areas. The smallholder sector is predominantly resource poor, largely subsistence and ownership of land is communal (with the exception of the small commercial sector). The majority of the smallholder farmers are located in low potential areas.

1.5.2 Enterprise Systems

Zimbabwe's agricultural production base is quite diverse. Although most of the land is grazed by livestock, cropping dominates from production policies and strategies.

a) Crops

The major crop in terms of land devoted to it is maize, which is also the staple commodity and accounts for 49 percent of total cropping area, millets 12 percent, cotton 8 percent, groundnuts 8 percent, sorghum 7 percent, sunflower 5 percent tobacco, 3 percent wheat 2 percent and soyabeans 1 percent. Minor crops account for 6 percent.

Smallholders produce and market the bulk of maize (55 percent), cotton (70 percent), sunflower (85 percent) and millets. A large proportion of the remaining crops is produced by the large scale sector primarily for sale with very little retained for on farm consumption. This sector produces 90 to 99 percent of all marketed flue-cured tobacco, soyabeans, sugar, coffee and export, horticultural crops.

Particular provinces dominate the production of these major crops. About 54 percent of total marketed maize comes from three of the eight provinces, namely, Mashonaland East, Mashonaland Central and Mashonaland West. Manicaland produces most of the coffee, while sorghum, millets and sugar are dominated by Masvingo and a large proportion of the cotton comes from Midlands.

b) Livestock

More than 70 percent of Zimbabwe is pastoral land suited to the raising of livestock. The livestock industry includes the production of cattle and milk and to a lesser extent pigs, poultry, sheep and goats.

Beef cattle dominate the livestock sub-sector in Matebeleland and Masvingo. The smallholder sector accounts for 68 percent of the national herd but in terms of marketed numbers the large scale sector accounts for the larger share. With regard to dairy, large scale producers account for more than 95 percent of the commercial dairy herd.

Poultry and pigs have in the recent past gained importance as substitute to beef, which has become an expensive commodity largely because of tight supply of slaughter stock following the decimation of the cattle herd during the 1992 drought. In addition, the price liberalization measures implemented under the Economic Structural Adjustment Program have allowed beef prices to rise to reflect the market situation. Following these reforms, all agricultural products are now being sold to best advantage through both traditional marketers and new entrants, who are now operating in the liberalized environment.

1.6 ZIMBABWE'S TRADE IN THE SOUTHERN AFRICAN REGION

Zimbabwe's share of trade in the SADC region is only second to South Africa. About 27 percent of her global exports go to SADC countries and 43 percent of her total imports come from the region. South Africa is her dominant trading partner accounting for 36 percent of all exports to the SADC region and 89 percent of total imports from the region. Other important partners are Botswana, Zambia and Mozambique.

Although the COMESA has addressed trade issues for a longer period and has made significant progress in reducing trade barriers, its share of Zimbabwe's global trade is relatively small. The COMESA accounts for 14.2 percent of Zimbabwe's global exports and only 3.8 percent of her global imports.

Trade liberalization is a major component of the economic reform program. Prior to the implementation of reforms, numerous barriers to trade were in place. Tariff and non-tariff barriers were the major instruments which have continued to be used for selected products. The foreign exchange policy was also used to control imports and exports. Restrictions in foreign currency allocations, coupled with high import tariffs, barred importation of many products. Import licenses were used as the major form of non-tariff instruments for restricting imports. An import surtax was also imposed over and above tariff and non-tariff barriers.

With respect to exports, Zimbabwe has traditionally not provided direct subsidies. Most of the subsidies have been of a developmental nature which include provision of extension services, provision of agricultural research as well as disease and pest control. The imposition of a five percent levy on tobacco, the major export crop, has the effect of an export tax. Furthermore, there are bureaucratic barriers to exporting. Exporters are required to obtain permits from the Ministry of Agriculture. They must also be registered annually with the Reserve Bank. All exports in excess of $500 need special customs permits. All this involves a lot of documentation and time wasted in queues. This results in very high transactions costs.

1.6.1 External Factors Affecting Zimbabwe's Agricultural Trade

Global economy factors have sped up Zimbabwe's trade liberalization process. The outcome of the Uruguay Round of Negotiations, to which Zimbabwe is a signatory, sets a time table for significant reductions on trade barriers. The WTO agreement, which was borne out of the Uruguay Round of Negotiations, was first implemented in 1994. It gave developing countries, with a per capita income of at least US$1,000, 10 years to achieve their reduction commitments while industrialized countries were required to:

- reduce tariffs by 36 percent,
- reduce domestic support for agricultural production by 20 percent, and
- cut export subsidies by 36 percent while the volume of subsidized food would have to be cut by 24 percent.

Since Zimbabwe's GDP per capita was less than Z$1,000 these reductions did not directly affect her in that she did not have to make any reduction commitments. However, because her major trading partners had to meet these reduction commitments she was going to be affected indirectly. In a case such as the Lome Convention and trade protocols with the U.S., reduction commitments resulted in the erosion of preferences that Zimbabwe enjoyed. It meant that there was increased competition for access to these markets from those countries which had previously faced high barriers.

Other external factors which influenced the trade liberalization process were the regional arrangements, COMESA and SADC protocols. In the COMESA, tariffs have been generally reduced by up to 70 percent and trade has grown by more than 10 percent. To simplify procedures and reduce transactions costs, the single goods declaration document, which collapses various customs documents, was introduced. The SADC has also adopted that document. The SADC region is moving towards a Customs Union. This means that within the region trade barriers will be

eliminated. At bilateral levels, there are special arrangements on specific products. For example, Zimbabwe and South Africa have an agreement on beef which allows Zimbabwe to export 5,000 tons of beef duty free. The agreement, reached on the SADC trade protocol, is going to facilitate increased movement of commodities within the region.

1.6.3 Agricultural Exports

Zimbabwe's agricultural exports have traditionally been dominated by tobacco, sugar, cotton, maize and beef. Recently, horticultural exports and coffee have gained significantly in importance. Coffee exports increased from 3,937 metric tons in 1980 to 79,000 metric tons in 1996. Horticultural exports have increased from 13,146 metric tons in 1989 to 57,590 metric tons in 1996 (Statistical Bulletin, March 1997). Table 1.6 shows the pattern of agricultural exports since 1981. In the same table, the percentage contribution of each product to total export revenue is given. Dramatic increases in coffee exports since 1994 are revealed. In 1996, the share of coffee exports was second to tobacco. Horticultural products have also increased their export share. By 1995, they had gone up to 5 percent compared to less than 0.5 percent in 1981.

Contribution to agricultural output is not evenly distributed by province. Some provinces are better endowed than others; some are dominant in certain commodities. Tables 1.7 and 1.8 show the different export products and what proportion comes from each province.

Table 1.6 Principle Agricultural Exports, 1981 – 1995

(Z$'000)	1981	1982	1983	1984	1985	1986	1987	1988	1990	1991	1992	1993	1994	1995
Meat (fresh or frozen)	4,526	4,496	10,942	26,760	31,322	25,475	54,804	52,032	10,230	13,323	36,240	70,457	64,675	10,792
Other Meats	4,034	2,621	6,930	11,119	11,916	18,860	23,630	20,150	8,024	23,844	40,814	87,066	99,119	103,398
Maize	34,738	39,881	40,551	0	33,247	87,191	66,297	113,251	256,050	142,445	9,982	128,242	472,442	241,503
Malted Barley	3,534	3,688	3,852	1,782	4,679	4,656	4,810	6,271	11,524	14,679	17,489	23,179	34,117	60,731
Tea	5,870	6,056	10,126	25,462	23,159	21,342	17,865	22,310	31,862	43,094	37,548	64,720	92,274	95,191
Coffee	9,915	14,742	19,156	29,843	48,586	66,156	46,477	40,535	147,560	80,273	59,981	32,881	101,668	2,266,100
Raw Sugar	45,908	44,418	39,605	40,593	52,168	43,999	56,474	78,457	122,593	106,572	11,134	1,492	722,877	538,817
Refined Sugar	8,893	7,898	12,519	15,429	16,193	19,078	22,311	1,451	28,457	62,032	22,855	17	40,111	120,420
Other Food	5,561	4,777	6,464	9,638	16,599	25,755	37,934	43,542	80,130	111,483	161,849	458,954	1,456,519	1,044,767
Burley tobacco	3,981	1,501	929	687	714	3,052	1,629	1,254	1,689	8,307	18,963	9,568	303,953	109,306
Flue-cured tobacco	212,917	187,971	226,524	281,810	355,729	406,417	413,026	483,449	718,556	1,485,770	2,071,109	2,240,520	2,856,380	3,818,220
Other unmixed tobacco	1,392	2,843	2,237	1,546	5,917	11,905	11,254	15,309	114,749	87,073	134,384	155,362	305,872	160,034
Cattle hides	2,097	4,030	8,754	11,648	9,560	6,611	3,910	10,673	16,004	24,002	46,039	53,009	66,948	46,450
Cotton lint	61,240	52,764	74,716	117,421	151,678	132,825	123,100	149,336	211,742	216,946	138,661	181,859	481,560	392,960
Groundnuts	2,020	2,281	959	766	15	1,730	1,618	5,621	26,023	8,930	1,203	18,480	42,230	21,130
Maize seed	2,566	2,335	1,588	2,173	2,934	4,042	4,017	7,470	10,884	38,856	42,774	74,400	66,928	49,059
Total	409,192	382,302	465,852	576,677	764,416	879,094	897,210	1,051,113	1,796,077	2,467,629	2,851,025	3,600,206	7,142,998	7,139,559
Percentage share														
Sugar	13.4	13.7	11.2	9.7	8.9	7.2	8.8	7.6	8.4	6.8	1.2	0.0	10.7	9.2
Tobacco	53.3	50.3	49.3	49.3	47.4	47.9	47.5	47.6	46.5	64.2	78.0	66.8	48.5	57.3
Maize	8.5	10.4	8.7	0.0	4.3	9.9	7.4	10.8	14.3	5.8	0.4	3.6	6.6	3.4
Cotton	15.0	13.8	16.0	20.4	19.8	15.1	13.7	14.2	11.8	8.8	4.9	5.1	6.7	5.5
Agricultural Exports (% of Total)	46.1	47.4	45.4	45.4	49.5	51.7	47.4	41.4	49.7	52.8	44.48	42.01	53.23	44.56

Source: Ministry of Agriculture, Economics Division, 1997.

Table 1.7 Production of Principle Agricultural Exports by Province (in metric tons)

	*Mash West	Mash East	Mash Central	**Mat North	Mat South	Masvingo	Manicaland	Midlands	Total
Maize	316,153	196,408	196,887	9,670	9,003	79,390	121,819	81,275	1,010,605
Cotton	33,368	1,220	45,278	3	565	1,879	13,910	12,382	108,605
Tobacco	67,099	41,935	45,194	–	–	135	13,809	568	168,740
Meat (Beef Head Numbers)	714,293	850,025	518,037	469,508	467,986	368,566	598,387	927,022	4,913,824
Coffee	307	31	726	–	–	135	7,864	18	9,078
Horticulture									
Maize Seed	12,111	5,446	13,692	–	10	60	213	221	31,753
Sugar	212	705	1,990	–	–	3,611,374	8,544	–	3,622,825

Source: Central Statistical Office 1996

Note: These are 1995 figures

*Mash is an abbreviation for Mashonaland

**Mat is an abbreviation for Matebeleland

Table 1.8 Percentage Production of Principle Agricultural Exports by Province

	*Mash West	Mash East	Mash Central	**Mat North	Mat South	Masvingo	Manicaland	Midlands	Total
Maize	31.2	19.4	19.5	1.0	0.9	7.9	12.1	8.0	100
Cotton	30.8	1.2	41.8	–	0.6	1.8	12.8	11.0	100
Tobacco	39.8	24.8	26.8	–	–	0.1	8.2	0.3	100
Meat	14.5	17.3	10.5	9.6	9.5	7.5	12.2	18.9	100
Coffee	3.4	0.3	8.0	–	–	1.5	86.6	0.2	100
Horticulture									
Maize Seed	38.1	17.2	43.1	–	–	0.2	0.7	0.7	100
Sugar	–	–	0.1	–	–	99.7	0.2	–	100

Source:Central Statistical Office 1996

Note:These are 1995 figures

*Mash is an abbreviation for Mashonaland

**Mat is an abbreviation for Matebeleland

2. Procedure For Analyzing Comparative Advantage

2.1 INTRODUCTION

This section outlines the approach adopted in this study to evaluate the competitiveness of different farming communities in producing a variety of agricultural commodities. In particular, the study utilizes the domestic resource cost (DRC) ratio approach, which provides a framework for comparing the economic cost of domestic resources to the economic value added by a production activity. The intuition behind the approach is that if the economic value added outweighs the cost in domestic resources valued at their opportunity cost, then the production activity is competitive.

Each farming area in Zimbabwe is unique with regard to competitiveness in different production activities due geographic location (relative to markets, local and international, for inputs and outputs) and agroecological characteristics or suitability for growing different crops. Geographic location has a bearing on the costs of acquiring inputs and the net realization from selling outputs principally due to distance and quality of roads. Agroecological characteristics of each locale affect the yield of crops that can be grown. For these reasons we analyze the competitiveness of production activities in different geographic areas to allow us to capture these disparities.

The study also takes cognizance of the different farming systems in Zimbabwe. From the production technology point of view, the agricultural sector can be divided into high technology and low technology farming systems. In the high technology category are the large scale commercial farming areas, which are highly mechanized, have freehold title on their land and practice intensive agriculture by utilizing large amounts of cash inputs. The low production technology group includes communal farmers and small scale commercial farmers. These farmers utilize mainly ox drawn equipment and use relatively little chemical inputs. The major difference between communal and small scale commercial farmers is that the latter have a leasehold title to the land and face less land shortages. Communal farmers, on the other hand, farm small parcels of land under communal ownership. In some small scale commercial farming areas the difference has become very defuse as up to 10 members of a family separately farm portions of the farm (Mathe, Oni, 1994). Thus, unless they acquire loans as a group, the advantage of leasehold title as collateral for credit is less effective. Table 2.1 summarizes the farming systems considered in this study.

Table 2.1 Zimbabwe's Farming Sub-Sectors

Farming System	Characteristics
Communal	Communal land tenure, labor intensive production system using ox-drawn implements, semi-commercialized
Small Scale Commercial	Leasehold title to land, labor intensive production with little use of tractor drawn implements; most farmers use ox drawn implements; most production for the market
Large Scale Commercial	Freehold title to land, highly mechanized, fully commercialized

2.2 DOMESTIC RESOURCE COST (DRC) METHOD

DRC for a commodity is calculated as:

where a_{ij}, 1 to k = coefficients for traded inputs

a_{ij}, k+1 to n = coefficients for domestic resources and non-traded intermediary inputs;

V_j = shadow price of domestic resource or non-traded input;

p_j^b = border price of traded input; and

p_i^b = border rice of traded output. (Tsakok, 1990)

The coefficients a_{ij} are quantities of inputs or resources required to produce a unit of output. In short the following formulation define the DRC ratio as:

> DRC = (domestic and non-traded inputs valued at opportunity cost) divided by (net foreign exchange earned or saved by producing the good domestically).

A DRC ratio of between 0 and 1 indicates that by producing the good domestically the country saves foreign exchange. If, on the other hand, DRC is greater than 1 or less than 0, it implies the country incurs costs in producing locally in excess of what it would cost to import the good. If the country can gain by producing locally for export, with outputs and inputs valued at their opportunity cost, then it is competitive internationally in the production of the commodity.

2.3 PROCEDURE OF DRC COMPUTATION

The following section outlines sources and treatments of information required to come up with competitiveness measures.

2.3.1 Enterprise Budgets

The primary piece of information required to come up with DRCs is the enterprise budget showing the productivity and input requirements for producing a particular commodity within a particular region. For the communal and small scale commercial farming systems the study looked at the input-output relation for the average farmer and the best farmer to get an idea of the current production possibilities and the prospects for improvements to existing standards.

2.3.1.1 Communal and Small Scale Commercial Sectors

Data pertaining to yield and input usage by communal and small scale commercial sectors was compiled for this study by Chidhuza, Mukwereza and Chaonwa. Information was sourced on yield and input usage for the average farmer and best farmer across different districts and agroecological zones from district extension officers in the 57 rural districts of Zimbabwe.

2.3.1.2 Large Scale Commercial Sector

Yield data for the large commercial farmers was obtained from a census of production information collected annually by the Central Statistical Offices (CSO). Through surveys, Commercial Farmers Union (CFU) collects information relating to input usage across different agroecological zones. Other information collected include prices of inputs, transport cost, output prices, etc.

Detailed budgets for each sector in the different agroecological zones are given in Appendix 1.

2.3.2 Domestic or Primary Resources and Non-Traded Inputs

The next task in DRC computation is identifying and evaluating the market and opportunity costs of primary and non-traded inputs within enterprise budgets. The primary resources are land, labor, and capital. The non-tradeable inputs are taken to be the imputed primary resources used in making tradeable inputs such as fertilizer, agrochemicals, transportation, seed, fuel and lubricants, and packaging products. The approaches used in evaluating these primary and non-traded inputs are discussed below.

2.3.2.1 Land

Land opportunity costs should reflect the approximate annual value of using each type of land. With competitive rental markets, opportunity cost of land would be reflected by the rental value. However, there is no

actual rental market in Zimbabwe implying we have to use another method to estimate the shadow price for land. The approach adopted in this study is to take land as a capital resource in production. The farmer by going into farming ties up his/her money in land which could have earned some returns in alternative investments. We also assume that the use of land decreases its usefulness over time.

An approach to annualize costs of capital equipment is to use the cost recovery factor method. This is equivalent to using annual payments of a mortgage on the present value of the capital equipment. Using this analogy the annual use or cost recovery (R) of a hectare of land at present value, P, is given by:

$$R = P \{[I(1+I)^n]/[(1+I)^n-1]\}$$

where 'I' is the real interest rate; 'n' is the number of years equivalent to the long term loan repayment period; and the expression in parentheses, (R/P), is termed the cost recovery factor. (F.J. Stermole, 1982) In 1996, the real interest was estimated to be around 10 percent based on market commercial bank loan rate of 32 percent and mid-year inflation of 22 percent. (Gemini Consulting, 1996) The repayment period for long term land purchasing loan is assumed to be 30 years. Thus, using this approach, a cost recovery factor of 0.1061 is estimated.

The above cost recovery factor approach was applied to average purchase prices of land in different agroecological zones to come up with annual land use cost estimates. The CFU tracks trends in purchase prices of land that can be classified as arable and grazing for the different agroecological zones. The best arable land in each of the agroecological zones tends to be in large scale commercial farming. The greater part of the land in smallholder sector (small scale commercial and communal farmers) is in locations that arguably are best suited for cattle grazing. For communal and small scale commercial sectors, it is assumed that the price of grazing land for each zone is the value or shadow price of land. Information from the CFU estimates that the price ranges for land in different agroecological zones are as follows:

- in zones IV and V: Z$250 to Z$500 for both grazing and arable land per hectare;
- in zone III: Z$2,000 to Z$4,000 for arable land and Z$500 to $Z1,000 for grazing land per hectare; and
- in zone II and I: Z$7,000 to Z$10,000 for arable land and Z$1,500 for grazing land per hectare.

2.3.2.2 Capital

This is taken to be seasonal credit and equipment depreciation. This study assumes that half of the seasonal or variable costs will be financed through credit. Market interest rates will be recorded and become the weighted average of interest rates charged by all lending institutions with shares of the total agricultural credit market as weights. The real interest rate (shadow price of capital) would be the difference between the inflation rate and the market interest rate. These rates are bound to be different between the large scale and small scale sectors since the small scale sector is almost exclusively dependent on the Agricultural Finance Corporation (AFC) while the large scale is served by both the AFC and commercial banks.

Annual equipment depreciation for the large scale sector is taken to be the cost recovery value of the equipment using the procedure adopted for land. Prices of farm equipment were sourced through surveys of dealers.

2.3.2.3 Labor

In both large scale commercial and communal agriculture there exists a market for hired unskilled labor. Most of the unskilled labor hired by large scale farmers comes from the adjacent communal areas. Their opportunity cost is what they would get if hired in communal areas. These wages are reported annually by the CFU. The study also takes the figures for hired communal laborers as the opportunity cost of all labor in communal areas.

For more skilled labor such as mechanics and drivers the CFU and CSO keeps track of these wages annually. Because their skills are useful in many other sectors of the economy and their mobility within sectors is not restricted, we assume the market for their skills to be competitive.

2.3.3 Tradeable Inputs

The rest of the inputs in the production are tradeable to a greater or lesser extent. The study adopts the approach taken by Masters (1990) and Jansen (1994) in analyzing the shadow price of these intermediate inputs. This involves breaking down the market prices of these inputs into their components, identifying taxes/ subsidies, import and domestic resource components based on surveys of input or service providers. After this disaggregation the tradeable components are valued at their import or export parity price while domestic inputs are valued at their shadow prices.

Compound (NPK) fertilizers are considered partly tradeable since they consist of imported ammonia and other additives, domestically-provided capital, labor, locally mined phosphate rock and sulphur, hydroelectric power and manufacturing costs.

Straight nitrogen fertilizer on the other hand can be considered 100 percent tradeable. Even though it is locally manufactured in the form of ammonium nitrate using local electricity and imported ammonia, it is fully substitutable with imported urea. The study takes the trade parity price of equivalent (nutrient content-wise) urea as the opportunity cost of ammonium nitrate. Information on these chemicals is sourced from data sheets of the IMF's "International Financial Statistics" and the FAO's "Food Outlook." Local transport cost figures are sourced from the National Railways of Zimbabwe and annual survey of road transporters by the CFU.

Seeds are considered tradeable since Zimbabwe has been exporting some seeds to neighboring countries. Also, foreign seed has been competing with Zimbabwe produced seed on the local market. Because of this competition we assume the local seed prices to be trade parity. Shadow prices in this study are taken to be the average prices from surveys for the small scale sector and CFU reference prices for the large scale sector.

Chemicals, packaging materials, tractor operating costs, irrigation costs and transport are taken to be less than 100 percent tradeable; the percentage tradeable is ascertained by industry surveys.

Government intervention in agricultural inputs is mostly in the form of import duties and maintaining an overvalued exchange rate regime. Membership in a farmer organization exempts a farmer from paying sales tax. Based on rates of duties charged on the imported content of inputs and the levels of import content from industry surveys by the Ministry of Lands and Agriculture the study arrived at factors for converting market to economic prices (CF) as follows:

$$CF = 1 - D/100 \times F\%$$

where D is percent duty chargeable and F percent is the proportion import value of the import. The information on import content and conversion factors for a number of common inputs used in the agricultural sector are given in Appendix 2.

2.3.4 Adjusting Input-Output Prices to Farm Level

The distance to markets for inputs and outputs as mentioned in the introductory section has a very significant bearing on the DRC and hence on the competitiveness of a region in producing a commodity. It affects the final cost of an input to the farmer and it affects the farmgate economic value of the product. In this study, we construct tables of distances between centers of production and price reference points. Price reference points include the nearest major cities, borders and ports of entry. Ports of entry include Beira, in Mozambique, and Durban and Port Elizabeth, in South Africa. At the area level, the study used the district centers as the reference point. In all there are 57 rural districts in the eight provinces of Zimbabwe. To reflect distances from district centers and the farmgate we assume the district is shaped as a circle with the district center at the center. This gives half the radius of the circle as the average distance of any farm in the district to the center. This translates to:

$$\text{Distance: farm to center} = 0.5 \times \sqrt{\text{area} \times 7/22}$$

The above information is transformed into transport cost by applying average per unit transport costs based on surveys of major fleet operators and rail operators reported by the CFU. These costs were used to bring prices from reference points to the farmgate.

Detailed data on transportation cost from districts to Harare and Mutare are given in Appendix 3.

2.3.5 Output Trade Parity Prices

The last piece of information is the economic farmgate price. This is the average economic value a farmer within an area of production receives from the exportation of a unit of output. This involves determining the form in which the output is traded internationally; evaluating the economic cost of transforming the farm output to exportable output at the border; the export price of this product at the border; and, finally, deducing the price at the farm.

Fortunately, most agricultural crops grown in Zimbabwe are marketed internationally in the form in which they leave the farm. These are commodities like maize, wheat, tobacco and rice. In these cases the bridging costs between the producing area and the international market consist mostly of transport and handling. Other crops, however, need initial processing before they are exported or imported. These are crops such as cotton and crusher grade groundnuts. For example, the export of cotton involves ginning to separate link and seed. Seed is then crushed to produce oil and seed meal. The three products are separately traded on the international market. Intermediate stages together with the transport and handling costs have to be netted out of the border price of the exportable components to come up with a farmgate price.

Table 2.2 International Output Prices

Crop	Price US$	
Maize	125.79	Export parity
Groundnuts	836.45	Export parity
Millets	95.59	Export parity
Sorghum	76.41	Export parity
Soya cake	218.03	Export parity
Sunflower cake	151.51	Export parity
Wheat	285.27	Import parity
Cottonseed	170.36	Export parity
Cotton Lint	1,415.60	Export parity
Barley	282.99	Import parity
Dry Beans	525.60	Import parity
Soyabeans	323.51	Export parity
Potatoes	210.76	Export parity
Sunflower seed	284.48	Export parity
Tomatoes	285.71	Export parity
Tobacco leaves	2,694.58	Export parity
Tobacco (12)	2,724.24	Export parity
Onions	360.86	Export parity

A problem with using international market prices is which price to use – the import or export parity price? In this study, we got around this problem by observing trends in import and export quantities in recent years. For commodities in which Zimbabwe is a net importer in most years we used the import parity prices. Conversely, for commodities in which Zimbabwe has been a net exporter in most years we used the export parity price.

Information on international prices was sourced from IMF's International Financial Statistics Handbook and from FAO's FAOSTAT website on Agricultural Statistics. Costs of intermediate processing is solicited from processing and trading companies. Table 2.2 summarizes economic product prices at Harare used in this study.

2.3.6 Currency Exchange Rate Regime

Zimbabwe was maintaining an overvalued exchange rate during the year 1996. Even though Zimbabwe abolished the fixing of foreign exchange rates in July 1994, the Central Bank still controls exchange rates through market operations. The down slide against major currencies in the currency of South Africa, Zimbabwe's principal trading partner in February 1996, in particular prompted the use of these stabilization measures leading to overvaluation of the Zimbabwe dollar. The Governor of the Reserve Bank of Zimbabwe estimates that the differential between inflation in Zimbabwe and the trade volume weighted average of inflation in its major trading partners, a crude measure of overvaluation, was about 13 percent in 1996. (Financial Gazette, 5 July 1997) This was the figure used in this study to represent the currency overvaluation.

Currency overvaluation is a perverse distortion, which impact both agricultural inputs and outputs. The bulk of inputs contain imported ingredients. Overvaluation will tend to make such inputs cheaper than they really are leading to inefficiency in resource

allocation. This is actually a subsidy to farmers. On the other hand, overvalued exchange rates will make Zimbabwe's exports appear more expensive on the world markets, or will tax producers of export commodities.

The market exchange rate used in this study was Z$10.2 to US$1, the average rate for the months June 1995 to July 1996. This period approximates the time farmers acquired inputs and sold products for the 1995/96 season, the base period for this analysis.

2.4 FRAMEWORK OF ANALYSES

In the course of coming up with competitiveness measures for various agricultural commodities we reveal various distortions inherent in the agricultural industry of Zimbabwe. A simple way of visualizing these distortions and their impact on the Zimbabwe economy is the framework termed policy analysis matrix (PAM) elaborated by Monke and Pearson (1989). PAM is a product of two accounting identities. The first defines profitability as the difference between revenue and costs. The other measures the effects of government intervention or distortions as the difference between observed parameters and parameters that would exist if the distortions were removed. By filling in the elements of the PAM for agricultural activities, an analyst can measure both the extent of policy effects and the inherent economic efficiency (or comparative advantage) of the activity.

PAM is based the familiar equation:

Profit = Revenue - Cost

PAM, as presented in Table 2.3, has four columns. The first is for revenue, the second and third are for costs, and the last is for profitability. Each PAM contains two cost columns, one for tradable inputs and the other for domestic factors. It distinguishes between tradable inputs and domestic resources because exchange rate policies affect the former and because certain measures of efficiency require the distinction. Intermediate inputs – including fertilizer, pesticides, purchased seeds, electricity, transportation and fuel – are divided into their tradeable – input and domestic factor – components.

PAM has three rows. The first two rows represent the two different versions of the profit equation above, with the first row evaluated using actual (market) prices and the row below it evaluated at shadow or social prices. The effect of government policy (or market failure) are measured in the third row, for which each entry is simply the difference between its value in the first row and in the second row.

Private Profitability (D)

The data entered in the first row of Table 2.3 provide a measure of private profitability. The term private refers to observed revenue and costs, reflecting actual market prices received or paid by farmers, traders or processors. The private, or actual, market prices thus incorporate the underlying economic costs and valuations plus the effects of all policies and market failure. In Table 2.3, private profits D, are the difference between revenue (A) and costs (B+C); and all four entries in the top row are measured in observed prices. The components of these budgets are usual entered in the PAM as local currency per physical unit (Z$/hectare).

Table 2.3 Policy Analysis Matrix

	Revenues	Tradeable Costs	Domestic Factor Costs	Profits
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Policy Effects (or transfers)	I	J	K	L

D = A-B-C H = E-F-G I = A - E J = B-F L = I-J-K K = C-G L = D-H

Source: Pearson, S. R. and Monke, E. A. (1989).

The private profitability calculations show the competitiveness of the agricultural activity, given current technologies, output values, input costs and policy transfers (taxes and subsidies). The cost of capital, defined as the pre-tax return that owners of capital are required to obtain their investment in the system, is included in the domestic cost (C). Hence, profits (D) are excess profits above normal returns to operators of the activity. If private profits are negative (D<1), operators are earning a sub-normal rate of return and thus can be expected to stop this activity unless something changes to increase profits to at least a normal level (D=0). Alternatively, positive private profits are an indication of super normal returns and should lead to future expansion of the activity, unless the farming area cannot be expanded or substitute crops/activities are more privately profitable.

Social Profitability (H)

The second row of PAM uses social prices as indicated in Table 2.3. These valuations measure comparative advantage or efficiency in the agricultural activity. Efficient outcomes are realized when resources are used in activities which create the highest levels of output or incomes. Social profits (H) are an efficiency measure because outputs, E and inputs, F+G, are revalued in prices that reflect scarcity values or social opportunity costs. Social profits like private profits, are the difference between revenues and costs, all measured in social prices: H=(E-F-G). For outputs (E) and inputs (F) that are traded internationally, the appropriate social valuations are given by world prices. These are the cost insurance and freight (cif) import prices for goods or activities that are imported or therefore on board (fob) for prices of exportable. World prices represent the government's choice to permit consumers and producers to import or export or produce services and goods domestically. The social value of additional domestic output is the foreign exchange saved by reducing imports or gained by expanding exports.

The services provided by domestic factors such as land, labor and capital do not have world prices because the markets for those factors are considered to be domestic. The social valuations for those factors are determined by the estimation of the net income forgone because the factor is not employed in the best alterative use. A distinction is made between mobile and fixed factors of production. Mobile factors, usually capital and labor, are factors that can move from agriculture to other sectors of the economy, such as industry, services and energy. For mobile factors, prices are determined by aggregate supply and demand forces. Because alterative uses for these factors are available throughout the economy, the social values of capital and labor are determined at a national level, not solely within the agricultural sector.

Policy Effects (I, J, K and L)

The second identity of PAM concerns the difference between private and social valuations of revenues, costs, and profits. For each entry in the matrix measured vertically any divergence between the observed private (actual market) and the estimated social (efficiency) price are the effects of policies that lead to inefficient use of resources.

Any difference between A and E or between B and F is caused by some combination of trade restrictions, price control, tax/subsidy or exchange rate policies. If A exceeds E, either domestic consumers are forced to pay higher than world prices or the government treasury is directly subsidizing production causing an output transfer (I) equal to (A-E). Similarly, if B is less than F, tradeable inputs are subsidized, resulting in an input transfer (J) or (B-F). For domestic factors, the transfer (K) amounts to (C-G).

The net effect caused by policy and market failures (L) is the difference between effects on output (I) and on costs (J and K) thus L=(I-J-K). The net effect can also be found by comparing private and social profits. These measures of net effect must by definition be identical in the double-entry accounting matrix, L=(I-J-K) = (D-H).

Economic Efficiency Measures

Besides private profitability (D) and social profitability (H) other measures of economic efficiency and policy distortions include the national protection coefficient (NPC), the effective protection coefficient (EPC) and the resource cost ratio (RCR). NPC is computed as the ratio of A/E (Table 2.3). A NPC value greater than 1 indicates a subsidy on product price

while a ratio less than 1 indicates a taxation on product price. EPC provides an overall picture regarding the extent of protection with respect to all tradables for both products and inputs. It is computed as the ratio (A-B)/(E-F). An EPC value greater than 1 indicates overall subsidy while an EPC value less than 1 shows overall taxation. RCR compares the social cost of using domestic resources with the net value of foreign exchange generated, all values expressed in local currency. It measures the overall efficiency of the commodity system. RCR is computed as the ratio G/(E-F). If the RCR coefficient is greater than 1, then the opportunity cost of using domestic resources exceeds the value added (meaning, this socially unprofitable activity). If on the other hand, RCR value is less than 1, then the opportunity cost of using domestic resources is less than the value added (hence this activity is socially profitable). Thus, the RCR measures the overall efficiency of a commodity system.

3. Background on Crops Analysed

Zimbabwe is one of the few countries in southern Africa which is rated as agriculturally successful. For most crops, particularly food grain, Zimbabwe has managed to produce exportable surplus. This success is largely attributed to sound agricultural policies and good technical support services. This chapter presents an overview of crop and policy developments within the agricultural sector.

3.1 MAIZE

Maize is the most dominant crop grown by almost 90 percent of the farming community in Zimbabwe. In most years production exceeds national requirements. Maize's dominance is largely attributed to its use as the main staple food, industrial use particularly by the livestock and brewing industries. White varieties constitute the largest proportion of maize grown as these varieties are preferred for human consumption. Yellow varieties are grown mainly for stockfeed manufacture.

The maize industry has been very well supported with the bulk of research funds channelled into its development. These funds have come from both public and private sources. It is reputed that Zimbabwe was the first country in the world to commercially use single hybrid maize seed with the release of its SR52 variety. These efforts have continued over the years continuously bringing out new varieties suited to a variety of growing conditions. This has helped maintain a steady increase in productive potential as well as ensure that producers stayed ahead of disease outbreaks. To date, Zimbabwe boasts an excellent range of varieties, which require between 135 to 161 days for maturation.

Because of its importance to the nation, the maize industry has had a lot of political attention. Prior to 1991 a myriad of regulations governed the maize distribution system. All maize had to be delivered to the GMB with the exception of interfamily sales within individual districts. Only three companies – National Foods, Blue Ribbon Foods and Midlands Milling – processed maize meal. These companies received subsidies from the government in return for low prices to consumers. Producer prices were set by the government which maintained constant prices throughout the country and across seasons.

The regulations have resulted in severe distortions. Pan-territorial prices have resulted in net subsidization of farmers in regions remote from main consumption centers. This meant that regions which were better for growing low bulk but high value commodities ended up growing high bulk commodities such as maize. Pan-seasonal prices resulted in the GMB having to bear all storage costs. It was not economical for millers to store more than working stocks of grain. All these resulted in huge GMB deficits which the government had to finance.

The period from 1991 to 1994 witnessed a transformation of these regulations. First to go were restrictions of grain movement between communal areas. This was coupled with complete freeing of the maize trade in natural region IV and V as well as allowing GMB to sell grain to any individual ex-depot. (Takavarasha, 1994) In 1993, maize marketing was de-regulated in the rest of the country with the requirement that the big three milling companies sourced grain from the GMB being the only restriction on internal marketing. This de-regulation led to a rapid growth in the number of small scale milling companies who sourced their grain directly from farmers. In 1994, large scale millers were allowed to source grain from anywhere, and with the establishment of ZIMACE, farmers and private traders have become major participants. However, a perfectly competitive market is still not yet in place since the GMB still sets floor prices on a pan-territorial and pan-seasonal basis. The effect of this has been a concentration of

private trading activities in areas near major consumption centers leaving the GMB as the main customer in remote areas.

3.2 WHEAT AND BARLEY

Wheat and barley are crops that are grown as import substitutes for the baking and brewery industries, respectively. The crops share many common features the major being that they use similar inputs and, in Zimbabwe, are only grown during the winter months. In the case of barley, Zimbabwe has managed to attain self-sufficiency in most years with occasional small surpluses for exports. The average output for wheat has been around 230,000 tons compared to a demand of 300,000 to 325,000 tons giving a net import requirement of close to a 100,000 tons deficit.

Most wheat and barley is grown along the major water courses in Mashonaland Central (Mazowe River Basin), Mashonaland West (Manyame River Basin) and the Middle Save River Basin. In addition, small amounts are grown near most large towns where water is available. Because of high cash input requirements, these crops have mostly been grown by the large scale commercial farmers. Small scale production is limited to irrigation schemes. The water used in the production systems for wheat and barley comes from private and government dams. The public water sources are highly subsidized.

Barley is produced under contract to one company, the National Breweries, which enjoys a monopsony position in the market. There are indications that National Breweries has been exerting its market power resulting in inefficient prices. In August 1997, the Kwekwe Farmers' Association made representation to the Grain and Cereals Producers' Association expressing dissatisfaction with price and contract conditions offered by the National Breweries (CFU, September 1997).

In contrast to barley marketing, wheat marketing has undergone radical change since 1993. (Takavarasha, 1994) In 1993, the government relinquished its control on flour and bread prices and removed the system whereby the GMB allocated fixed quotas of wheat to different milling companies. However, until April 1994 farmers were restricted from selling wheat to anyone other than the GMB. As of April 1994 millers were free to directly contract farmers or international suppliers to acquire wheat. These developments also coincided with the opening of ZIMACE. As a result, there is now a more competitive market environment for wheat.

Despite the vast improvements in the marketing of wheat some problems still remain. There are sentiments that the major milling companies have been colluding to suppress prices offered to farmers. Despite the blossoming number of milling companies the top three companies still control the largest share of the market. As a result of the dissatisfaction with millers, farmers recently agreed to form a wheat marketing and storage cooperative in order to strengthen their hand in price negotiations. (CFU, September 1997)

3.3 SORGHUM

Sorghum is a drought tolerant crop mainly grown by communal farmers in marginal regions (NR IV and V). In Zimbabwe the industrial and commercial use of sorghum, and all small grains in general, are very limited. Commercially, sorghum is mainly used in brewing industries while pearl millet, though to a very small extent, is used for stockfeed purposes. Further, the export markets for these crops have not been fully exploited, hence markets are very thin. Within the large scale sector, sorghum production has been undertaken under contract with brewing companies, the largest being Chibuku Breweries.

Sorghum (particularly white) and pearl millets are grown for human consumption as substitute for maize in the drier parts of Zimbabwe. For decades policymakers have encouraged the production of sorghum and millets to reduce food shortages common in the communal sector of the dry natural regions IV and V in the belief these crops would out compete maize. Experience has shown, however, that maize, particularly the short season variety R200, has outyielded these small grains. Mazvimavi (1996) attributes

this higher yield to more research efforts being channelled into maize than to small grains. This situation has not been helped by poor world prices relative to maize. A peculiar phenomena though is that breweries have been buying sorghum at prices higher than import parity price. We speculate this could be due to quality problems – no appropriate varieties – on the world market. Further, the government has never had a clear policy on sorghum trade, sometimes restricting and sometimes freeing up trade.

The lack of processing technologies has hindered the development of alternative formal markets for sorghum. By using traditional processing technologies, sorghum takes longer to process than maize. This factor has reduced its demand by even the poorest of the poor communal households. (Mazvimavi, 1996)

3.4 OIL SEEDS

The most important oil seed crops in Zimbabwe are soyabeans, groundnuts and sunflower. Soyabeans are mostly grown by large scale commercial farmers whose land tends to have higher clay content. Most small scale commercial and communal farms tend to be sandy and not suitable to soyabean production. Soyabeans gained prominence in the early 1970s as a way of reducing dependence on imported fishmeal in stockfeeds. The advent of independence also brought about a surge in the demand for cooking oil due to a general rise in incomes. In the mid-1980s, soyabean oil surpassed groundnuts as the main source of cooking oil, contributing 40 to 45 percent of national requirements.

In contrast to soyabeans, sunflower and groundnuts are sometimes dubbed the 'communal crops' as they are predominantly grown by the communal farmers. These crops are more preferred by communal farmers as they require few cash inputs. In particular, sunflower is taking up land which would have been left fallow due to lack of inputs. The general practice is to plant and leave it to grow on its own with little inputs or weeding. Thus, regardless of yield sunflower will be competitive in most areas. Another factor favoring sunflower is its drought tolerance. Because of this feature it has started to attract the attention of large scale commercial farmers in drier areas such as natural regions III and IV.

By far the most area dedicated to groundnuts is in communal and small scale commercial sectors. In recent years this area has amounted to approximately 150,000 hectares. However, most of this production appears to be for subsistence as only 3,000 tons enter the formal market. A possible explanation for this low trade could also be that nearly all land in these sectors is planted in short season varieties, which are only suitable for crushing, as opposed to long season, which are used for confectionery nuts. Long season varieties fetch high prices on the international market and has greater demand in formal markets. These are the varieties grown in the large scale commercial sector. Because they require a longer season than can be provided by the average season in Zimbabwe, supplementary irrigation is requisite.

As was the case with maize, oilseed crops were controlled products prior to 1992. In 1993, the government de-regulated the internal marketing of all oilseeds. However, it maintained control of external trade in these products with the GMB remaining a residual buyer in the market defending a floor price. Oil expressers and stockfeed manufacturers are now free to contract directly with farmers for supplies. These developments have moved the marketing of oilseeds closer to perfect competition.

3.5 TOBACCO

Tobacco has been grown in Zimbabwe for slightly over 100 years. From the onset it has been the single largest export earner, accounting for about 30 percent of foreign exchange earnings. At present, Zimbabwe ranks as the second largest exporter of fluecured tobacco in the world after Brazil.

The tobacco industry, apart from its huge contribution in export earnings, is also the single largest employer of skilled and semi-skilled labor. (Zimbabwe Investment Center, Industry Profiles, 1997) Approximately 100,000 people are directly employed in

the industry. It accounts for a third of the agricultural labor and 10 percent of the national formal labor force.

Three types of tobacco are grown in Zimbabwe – flue-cured, burley and a small amount of oriental tobacco. The bulk of the crop is grown by large scale commercial farmers with communal farmers participating in burley production mainly in Mashonaland Central Province. Ninety-nine percent of the tobacco crop is exported to 86 countries worldwide. Tobacco is sold through auction floors renowned as the largest in the world. Up to 1996, all auction marketing was controlled by the Tobacco Marketing Board (TMB) with strong farmer representation. The 1997 buying season saw the opening of the Boka Tobacco Auction floors. The fact that most of the output is exported and that marketing is through an auction system has meant that prices have been very closely aligned to international supply and demand conditions.

Because most production is destined for the international market farmers have felt directly the impact of taxes due to the overvaluation of the Zimbabwean dollar. Also, the success of tobacco has made it an easy target for the government to directly tax. The past two years (1995 to 1997) has seen the introduction of a price levy and a yield levy. Also, bearing in mind that tobacco production is a major consumer of inputs with a high import content, this all results is high net taxation or divergencies between private and social profits.

3.6 COTTON

There are approximately 200,000 registered cotton producers, most of whom are in the communal and small scale producing sectors. These producers account for approximately 70 percent of total output, the rest coming from large scale producers. Traditionally, Zimbabwe is a surplus cotton producer exporting close to 40,000 tons of lint annually. In addition, it occasionally exports cotton seed cake to South Africa depending on the local stockfeed industry demand. In 1996, total production was about 283,000 tons.

This is due to unprecedented changes in government policy just prior to the 1995/96 agricultural season. (CFU Weekly Information Bulletins, 1997) The changes started with the decontrolling of cotton marketing by the government in April 1994 which effectively ended the monopsony situation enjoyed by the parastatal Cotton Marketing Board (CMB) and paved the way for its privatization. It also opened the way for the producer cooperative, COTPRO, to enter the market in 1995. International giant Cargill began marketing cotton in 1996. The trend has continued into 1997 with the Boka group of companies setting up cotton auction sales floors. The result of these developments has been intense competition, which in mid-1997 developed into price wars. This competition has tended to bring prices offered to farmers close to export parity and generally reduced marketing costs to farmers.

It is, however, the view of most industry participants that research has been lagging due to reduced funding. As a result yields are on a small but steady decline as varieties introduced many years ago are no longer pest resistant. Another problem facing the industry has been the shortage of labor for picking. A new development to counter this shortage has been the introduction of machine picking. This will undoubtedly have an impact on quality and hence prices farmers can get on the international markets. Despite these shortcomings the industry has been performing well.

3.7 OTHER CROPS

Two other crops which deserve mentioning because of their rapid proliferation within the past few years are paprika and sugar beans. Paprika is a new export crop that is gaining popularity in both the large scale commercial and small scale sectors. Agronomists attribute this to low input requirement as well as low pest and disease susceptibility. Sugar beans production, on the other hand, is dominated by large scale commercial (LSC) farmers and is grown mainly as an import substitute. Because the marketing of beans and paprika is devoid of direct government interference, indications show a bright future for these crops.

4. Competitiveness of Crop Production in the Large Scale Commercial Farming Sector

4.1 PRIVATE PROFITABILITY

Analyses of crop budgets revealed variability in profitability of crops grown in the large scale commercial farming areas (Table 4.1). Production of most crops is financially viable in agroecological zones 1 to 3. The major exception is dryland soyabean, which showed poor financial performance in all except zone 1. Not surprisingly, the major income earner in the sector is Virginia tobacco, which is closely followed by burley tobacco and paprika. With the exception of the irrigated crops, barley, wheat, sunflower and paprika, all other crops showed poor financial performance in the relatively dry zones 4 and 5. Maize, Zimbabwe's staple, was shown to be commercially viable only in agroecological zones 1 and 2.

4.2 SOCIAL PROFITABILITY

Social profitability which measures the returns from a national point of view was estimated to be generally positive in all agroecological zones and for most crops (Table 4.2). Sorghum is the only crop which showed negative social profits implying growing sorghum is an inefficient use of national resources. It follows also that sorghum must be a heavily subsidized crop for it to be financially viable to grow. Crops that give the highest returns from use of national resources are Virginia tobacco, burley tobacco and paprika. Crops that are socially profitable in all zones are cotton, sunflower and wheat.

4.3 POLICY INTERVENTIONS IN LARGE SCALE COMMERCIAL AGRICULTURE

Table 4.3 summarizes estimates of nominal protection coefficients (NPC) and effective protection coefficient (EPC) of different crop production activities in the large scale commercial sector. The former relates to an assessment of policy impacts on product price while the later gives an indication of overall impact of policy. NPC estimates indicate that all crops except maize and sorghum have been taxed. An NPC of 1.05 for maize indicate that market prices for maize

Table 4.1 Private Profitability for Large Scale Commercial Sector by Agroecological Zone

	Agroecological Zone (Z$/ha)				
	1	2	3	4	5
Barley	-1,963.54	544.09	-919.16	337.98	1,391.15
Burley Tobacco	15,701.91	6,513.90	3,934.11		
Cotton	1,600.76	1,395.89	511.40	-246.09	-246.09
Groundnuts	1,207.72	4,786.13	493.06	-1,110.65	-2,160.84
Maize	774.47	374.80	-94.92	-1,208.33	-1,208.33
Paprika	-5,887.26	14,446.49	831.27	1,016.77	1,016.77
Sorghum	2,060.87	1,009.21	770.91	75.88	-400.08
Soyabean	1,004.05	-579.97	-351.06	-1,470.27	-1,470.27
Sunflower	-230.52	1,112.33	1,088.55	719.91	719.91
Virginia Tobacco	5,077.21	18,524.75	10,946.67	5,397.20	-10,423.43
Wheat	-320.53	1,171.57	2,269.55	372.44	2,265.72

Table 4.2 Social Profitability for Large Scale Commercial Sector by Agroecological Zone

	Agroecological Zone(Z$/ha)				
	1	2	3	4	5
Barley	-435.28	2,663.28	730.32	2,239.99	3,541.33
Burley	21,955.56	11,209.40	8,102.24		
Cotton	3,952.87	3,603.77	2,351.22	1,348.35	1,348.35
Groundnuts	8,403.50	16,458.13	6,131.89	2,290.07	-73.78
Maize	980.37	585.58	96.55	-1,001.04	-1,001.04
Paprika	-1,664.53	21,401.62	5,885.60	6,071.10	6,071.10
Sorghum	-1,596.23	-1,878.29	-1,463.57	-1,580.24	-1,743.58
Soyabeans	2,787.58	703.36	846.44	-644.67	-644.67
Sunflower	1,555.83	3,855.79	3,476.82	2,656.95	2,656.95
Virginia Tobacco	13,339.78	29,780.03	20,397.53	1,3571.74	-5,769.73
Wheat	1,790.14	3,600.00	4,816.45	2,484.95	4,773.14

Table 4.3 NPC and EPC for the Large Scale Commercial Sector by Agroecological Zone

	NPC	EPC by Agroecological Zone				
	all zones	1	2	3	4	5
Barley	0.84	0.78	0.80	0.78	0.79	0.80
Burley Tobacco	0.88	0.87	0.86	0.86		
Cotton	0.82	0.77	0.76	0.75	0.72	0.72
Groundnuts	0.49	0.43	0.45	0.42	0.37	0.25
Maize	1.05	1.08	1.09	1.11	-29.55	-29.55
Paprika	0.88	0.82	0.86	0.85	0.85	0.85
Sorghum	3.25	6.29	6.76	1.40	-8.56	6.58
Soyabeans	0.80	0.75	0.72	0.71	0.62	0.62
Sunflower	0.65	0.57	0.59	0.59	0.57	0.57
Virginia Tobacco	0.88	0.87	0.87	0.87	0.87	0.83
Wheat	0.86	0.82	0.82	0.83	0.82	0.82

Table 4.4 RCRs for the Large Scale Commercial Farm Sector by Agroecological Zone

	Agroecological Zone				
	1	2	3	4	5
Barley	1.10	0.68	0.88	0.69	0.59
Burley Tobacco	0.40	0.53	0.58		
Cotton	0.52	0.53	0.59	0.69	0.69
Groundnuts	0.30	0.19	0.32	0.53	1.04
Maize	0.83	0.92	1.07	-83.41	-83.41
Paprika	1.18	0.34	0.65	0.63	0.63
Sorghum	3.72	4.86	-0.81	-8.01	7.15
Soyabeans	0.54	0.82	0.75	1.45	1.45

have been very close to international prices. Sorghum on the other hand is shown to be heavily subsidized. EPC estimates again show a similar pattern with all crops except sorghum and maize in all agroecological zones being taxed. Maize and sorghum are effectively subsidized in all agroecological zones. Further, the degree of subsidization increases in zones 4 and 5 due to these regions being further away from the main markets and government subsidizing transport through its pan-territorial floor price policy.

4.4 COMPARATIVE ADVANTAGE IN LARGE SCALE COMMERCIAL SECTOR

Resource cost ratios (RCR) for crops in the large scale commercial sector are summarized in Table 4.4. RCR estimates indicate that except for sorghum all other crops are competitive in at least one agroecological zone of Zimbabwe as indicated by a RCR of between 0 and 1. Paprika and barley are competitive in zones 2 to 5. In zones 1, 2 and 3, in which it is currently being grown, burley tobacco is competitive. Cotton, sunflower and wheat are competitive in all zones. Groundnuts and Virginia tobacco are competitive in zones 1 to 4, maize in zones 1 and 2, while soyabean is competitive in zones 1, 2 and 3.

4.5 SENSITIVITY ANALYSIS OF COMPARATIVE ADVANTAGE

Two major factors affecting comparative advantage are yields and international output prices. To view the possible impacts of these factors on competitiveness the study simulates changes in these factors that would make the RCR just equal unit or be on the border line between being competitive and being uncompetitive. A negative would entail reducing the factor to bring RCR to 1. Alternatively, a positive would mean we are coming from an uncompetitive position toward competitiveness. Tables 4.5 and 4.6 summarize the results of these simulations for international prices and yields, respectively.

4.5.1 Sensitivity to World Prices

For barley, the results show that a 6 percent increase in world prices would make barley competitive in all zones. Alternatively, it would require a drop in world prices of about 31 percent to make barley uncompetitive nationwide. Burley tobacco shows strong competitiveness since it would require about 54 percent drop in world prices to turn it into an uncompetitive crop nation wide. For groundnuts, a 22 percent drop in world price will only make it uncompetitive in zones 4 and 5. Maize however is very sensitive to world prices. We would expect a drop of 14 percent to make maize uncompetitive throughout. To make sorghum competitive in at least one zone would require international price increases of above 36 percent. Sunflower, Virginia tobacco and wheat are quite resilient requiring drops of over 25 percent in prices before becoming uncompetitive.

4.5.2 Sensitivity to Yield

For barley, the results show that a 7 percent increase in yield would make barley competitive in all zones. Alternatively, it would require a drop in yield of about 34 percent to make barley uncompetitive nationwide. Burley tobacco shows strong competitiveness since it would require about 55 percent drop in yield to turn it into an uncompetitive crop nationwide. For cotton, a 22 percent drop in yield will only make it uncompetitive in zones 4 and 5. In the case of groundnuts, a 3 percent increase in yield would make it competitive nationwide, whereas it would require a massive 75 percent yield drop to make groundnuts uncompetitive throughout. Maize however is very sensitive to yield. We would expect a drop of 15 percent to make maize uncompetitive throughout. To make sorghum competitive in at least one zone would require yield increases of above 118 percent. Sunflower, Virginia tobacco and wheat are quite resilient requiring drops of over 27 percent in yield before becoming uncompetitive.

Table 4.5 LSC: Percentage Change in World Price to Make Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zone(percent)				
	1	**2**	**3**	**4**	**5**
Barley	5.91	-23.82	-8.96	-22.9	-31.09
Burley Tobacco	-53.88	-40.75	-35.19		
Cotton	-37.79	-36.91	-30.65	-21.48	-21.48
Groundnuts	-61.5	-73.1	-57.93	-37.19	2.07
Maize	-13.81	-8.98	-2.22	40.64	40.64
Paprika	12.57	-58.35	-28.88	-29.8	-29.8
Sorghum	36.3	53.39	52.99	74.86	99.12
Soyabean	-35.14	-13.12	-17.22	21.64	21.64
Sunflower	-31.7	-49.52	-51.84	-49.52	-49.52
Virginia Tobacco	-37.12	-53.96	-46.80	-38.37	45.31
Wheat	-24.96	-34.04	-39.88	-30.12	-40.17

Table 4.6 LSC: Percentage Change in Yield That Makes Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zone(percent)				
	1	**2**	**3**	**4**	**5**
Barley	7.16	-25.98	-9.40	-24.94	-34.07
Burley Tobacco	-54.72	-41.38	-35.73		
Cotton	-39.52	-38.61	-32.03	-22.41	-22.41
Groundnuts	-63.57	-75.57	-59.87	-38.38	2.29
Maize	-14.73	-8.31	0.73	57.84	57.84
Paprika	12.8	-59.27	-29.33	-30.25	-30.25
Sorghum	118.28	155.6	155.62	204.49	258.03
Soyabeans	-38.17	-13.99	-18.48	24.2	24.2
Sunflower	-34.72	-54.58	-57.15	-54.54	-54.54
Virginia Tobacco	-37.52	-54.56	-47.32	-38.78	45.89
Wheat	-27.22	-37.34	-43.83	-32.96	-44.16

5. Competitiveness of Crop Production in the Small Scale Commercial Farming Sector

5.1 PRIVATE PROFITABILITY

Table 5.1 summarizes financial profitability of major crops in the small scale commercial farming sector (SSC). Estimates of profitability for each crop were based on average farmer practices and best farmer practices in each zone. The designation "1" represents average farmer practice and "2" represents best farmer practices in each zone. Results indicate that cotton, groundnuts and sunflower are financially viable in all regions in which they are grown, and using both average and best farmer practices. For maize, financial viability is achieved in zones 1 and 2 by only using average farmer practices, and zones 1, 2 and 3 by using best farmer practices. For sorghum, only farmers in zone 1 achieve financial viability using average practices, whereas farmers in zones 1 and 2 are profitable using best farmer practices. Estimates also show that there are great disparities between average and best farmers in terms of profitability. For example, in cotton best farmers are reaping on average three times the profits of average farmers. Further, the disparities in profits between farmers using best and average practices tends to be greatest in zones 1 and 2 and lowest in zones 4 and 5.

5.2 SOCIAL PROFITABILITY

Low cotton yields under average farmer practices in the small scale commercial sector has resulted in it being socially unviable (Table 5.2). Nevertheless potential for economic viability in the sector exists as indicated by the very high social returns under best farmer practices in the same regions. Results indicate that groundnuts provide the best social return in the sector under both average and best farmer practices. Groundnuts are also socially profitable in all regions. Results for maize shows the same picture as with financial profitability. Under average farmer practices maize is profitable in zones 1 and 2. Under best farmer practices it is socially profitable in zones 1 to 3. Similar results for maize were observed in the large scale commercial sector. Again, as was the case in the large scale commercial sector, sorghum is shown to yield losses from the society's point of view in all zones, while sunflower is socially profitable throughout.

Table 5.1 Private Profitability for Small Scale Commercial Sector by Agroecological Zone

	Agroecological Zone (Z$/ha)				
	1	2	3	4	5
Cotton 1		1,178.46	1,370.54	1,242.49	1,242.49
Cotton 2		4,501.32	4,181.18	3,092.70	3,092.70
Groundnut 1	1,203.56	1,316.27	1,316.27	978.13	572.37
Groundnut 2	3,879.74	3,879.74	2,527.18	1,287.34	949.2
Maize 1	435.08	362.84	-96.89	-582.89	-747.08
Maize 2	1,236.87	1,105.52	133.52	-858.19	-1,061.78
Sorghum 1	95.32	-74.24	-67.72	-67.72	-67.72
Sorghum 2	1,275.54	577.75	-139.60	-283.07	-550.44
Sunflower 1		559.38	525.36	355.27	332.6
Sunflower 2		1,685.57	608.34	347.54	211.47

Table 5.2 Social Profitability for Small Scale Sector by Agroecological Zone

	Agroecological Zone(Z$/ha)					
	1	2	3	4	5	
Cotton 1			-546.54	-201.83	-325.63	
Cotton 2			6,914.63	6,552.12	5,102.28	
Groundnut 1		5,824.36	6,235.02	6,314.52	5,135.54	3,657.17
Groundnut 2		18,660.20	18,660.20	13,811.80	9,347.56	8,115.59
Maize 1		292.71	222.03	-148.31	-570.85	-731.51
Maize 2		1,120.27	991.74	120.16	-797.21	-996.42
Sorghum 1		-827.54	-793.38	-715.19	-662.19	-662.19
Sorghum 2		-1,944.93	-1,804.34	-1,580.30	-1,498.40	-1,444.52
Sunflower 1			1,260.77	1,274.50	998.65	954.80
Sunflower 2			4,240.81	2,237.61	1,786.38	1,523.30

5.3 POLICY INTERVENTION EFFECTS

To assess the implication of policies on different production activities we estimated the differences between private and social profitability in addition to NPC and EPC. The first option gives us in dollar terms how much the government is giving or taking away from a production activity, whereas NPC and EPC give the effects of government policy in ratio terms. Table 5.3 summarizes government net policy effects in money terms per hectare. A positive figure indicates a subsidy while a negative denotes a tax.

Results indicate that cotton under average farmer practices and sorghum under both average and best farmer practices have been heavily subsidized. Groundnuts and sunflower have been severely taxed. Maize has been subsidized in zones 1, 2 and 3, and taxed in zones 4 and 5.

NPC results show that interventions on output prices have tended to tax cotton, groundnuts and sunflower, and subsidize sorghum production (Table 5.4). Maize prices have tended to be aligned with world prices. EPC results, however, show that inputs involved in cotton production, under average practices, maize and sorghum have been subsidized, while other production activities in the sector have been taxed.

Table 5.3 Net Policy Effects for Small Scale Commercial Sector by Agroecological Zone

	Agroecological Zone(Z$/ha)					
	1	2	3	4	5	
Cotton 1			1,724.99	1,572.37	1,568.12	
Cotton 2			-2,413.31	-2,370.94	-2,009.58	
Groundnuts 1		-4,620.8	-4,918.75	-4,998.25	-4,157.41	-3,084.81
Groundnut 2		-14,780.46	-14,780.46	-11,284.62	-8,060.22	-7,166.38
Maize 1		142.37	140.81	51.42	-12.04	-15.57
Maize 2		116.61	113.78	13.36	-60.98	-65.36
Sorghum 1		922.85	719.14	647.47	594.47	594.47
Sorghum 2		3,220.47	2,382.09	1,440.71	1,215.33	894.08
Sunflower 1			-701.39	-749.13	-643.38	-622.21
Sunflower 2			-2,555.24	-1,629.27	-1,438.84	-1,311.83

Table 5.4 NPC and EPC for Small Scale Commercial Sector by Agroecological Zone

	NPC	EPC by Agroecological Zone				
	All Zones	1	2	3	4	5
Cotton 1	0.82		1.76	1.61	1.71	
Cotton 2	0.82		0.8	0.8	0.8	
Groundnut 1	0.36	0.36	0.36	0.36	0.36	0.36
Groundnut 2	0.36	0.35	0.35	0.35	0.34	0.34
Maize 1	1.05	1.06	1.06	1.07	1.1	1.15
Maize 2	1.05	1.06	1.06	1.07	1.11	1.15
Sorghum 1	3.25	2.41	2.95	2.92	2.92	2.92
Sorghum 2	3.25	2.34	2.91	4.57	8.95	3.47
Sunflower 1	0.65		0.63	0.63	0.63	0.63
Sunflower 2	0.65		0.62	0.61	0.61	0.6

5.4 COMPARATIVE ADVANTAGE IN SMALL SCALE COMMERCIAL SECTOR

Results for RCR analysis reflect observations in the previous subsections (Table 5.5). They show cotton to be uncompetitive among average farmers and competitive among best farmers. Both average and best farmers are very competitive in groundnut production with RCRs in the 20 percent range. The results also shows maize being marginally competitive in regions 1 and 2 for both average and better farmers, and marginally uncompetitive for better farmers in zone 3. Sorghum is again shown to be uncompetitive under both practices. Sunflower is estimated to be competitive in all areas.

5.5 SENSITIVITY ANALYSIS OF COMPARATIVE ADVANTAGE

As was done for the large scale commercial sector, we simulate changes in yield and world prices required to make crop production activities just competitive. Results of these analyses are presented in Tables 5.6 and 5.7 for world prices and yield, respectively.

Results indicate that cotton production under average farmer practices is only marginally uncompetitive since a mere 10 percent increase in world prices would make it competitive. If these average farmers perform to the level of best farmers in their areas, as much as a 50 percent decline in prices would be required to make them uncompetitive.

Table 5.5 RCRs for Small Scale Commercial Farm Sector by Agroecological Zone

	Agroecological Zone				
	1	2	3	4	5
Cotton 1		1.28	1.10	1.17	
Cotton 2		0.45	0.45	0.47	
Groundnut 1	0.21	0.21	0.20	0.21	0.24
Groundnut 2	0.18	0.18	0.20	0.24	0.25
Maize 1	0.92	0.95	1.16	1.89	2.83
Maize 2	0.81	0.83	1.02	1.74	2.24
Sorghum 1	2.46	3.65	3.33	3.15	3.15
Sorghum 2	1.74	2.49	4.95	10.50	4.83
Sunflower 1		0.45	0.42	0.43	0.44
Sunflower 2		0.39	0.47	0.50	0.52

Results show very strong competitiveness in groundnut production as indicated by the over 70 percent increase decrease in prices before it becomes uncompetitive. In contrast, it would take at most 16 percent decrease in price to make maize uncompetitive in all areas. Thus, maize is very sensitive to changes in world prices. At the other extreme is sorghum which would need more than a 100 percent increase in world prices before it becomes competitive in all areas. Sunflower's competitiveness, however, is hardly questionable as it would require at least 39 percent reduction in prices to make it uncompetitive.

Results of yield change simulations give comparable require changes. (Table 5.7)

5.6 SSC: Percentage Change in World Price That Makes Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zones (percent)				
	1	**2**	**3**	**4**	**5**
Cotton 1		9.80	3.37	5.69	
Cotton 2		-49.58	-49.45	-46.90	
Groundnuts 1	-75.66	-76.23	-77.21	-76.25	-73.09
Groundnuts 2	-77.57	-77.57	-75.55	-71.96	-70.29
Maize 1	-8.08	-6.41	6.06	41.47	72.12
Maize 2	-15.46	-14.26	-2.50	30.40	45.85
Sorghum 1	94.09	121.89	108.42	100.38	100.38
Sorghum 2	55.28	70.00	98.18	105.81	136.86
Sunflower 1		-48.17	-50.59	-49.24	-48.64
Sunflower 2		-51.85	-44.13	-41.37	-38.80

5.7 SSC: Percentage Change in Yield That Makes Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zones (percent)				
	1	**2**	**3**	**4**	**5**
Cotton 1		10.48	3.72	6.17	
Cotton 2		-51.91	-51.78	-49.1	
Groundnuts 1	-78.24	-78.83	-79.84	-78.85	-75.58
Groundnuts 2	-80.22	-80.22	-78.12	-74.4	-72.67
Maize 1	-7.41	-5.19	11.41	58.52	99.28
Maize 2	-17.12	-15.52	0.17	44.04	64.63
Sorghum 1	238.87	299.35	270.73	253.71	253.71
Sorghum 2	155.61	188.06	250.53	267.71	336.38
Sunflower 1		-53.17	-55.86	-54.34	-53.68
Sunflower 2		-57.24	48.63	-45.55	-42.69

6. Competitiveness of Crop Production in the Communal Farming Sector

6.1 PRIVATE PROFITABILITY

Results from crop budgets indicate that most crop production activities in the communal sector are financially viable. (Table 6.1) In particular, burley tobacco, cotton, finger millet and sunflower yield positive profits in all areas under both average and best farmer practices. Groundnuts, unlike in the other sectors, is shown to be financially viable only in zones 2, 3 and 4. Maize is financially viable in natural region 2 and 3 under average farmer practices and 1, 2, and 3 under best farmer practices. Unlike in the small scale commercial sector, sorghum is financially viable under average farmer practices in the communal sector. Some results may seem counter intuitive. What we are terming best farmer practices are yielding less profits in burley tobacco and sorghum. This anomaly stems from defining "best" to mean high yield rather than high profit. Thus in these particular cases the increase in yield is coming from excessive costs in added inputs.

6.2 SOCIAL PROFITABILITY

Social profitability results portray a varied picture. (Table 6.2) For burley tobacco results show very high social profits from this production activity. It is also the highest social profit earner of all commodities in this sector. As discussed above, "best" performers in this sector may be over-using resources as indicated by lower social profit. This phenomenon can also be observed for cotton, maize, groundnuts, finger millet and sunflower. For sorghum, however, best practices actually yield positive social profit unlike in the other sectors indicating that with few improvements sorghum can be socially profitable in natural regions 3, 4 and 5. This is important because maize, the other major grain crop, is not socially profitable in these zones of this sector.

Table 6.1 Private Profitability for Communal Farm Sector by Agroecological Zone

	Agroecological Zones (Z$/ha)				
	1	2	3	4	5
Burley 1		11,896.37	6,101.61		
Burley 2		8,534.3	856.65		
Cotton 1		1,825.28	1,152.95	640.71	480.63
Cotton 2		2,875.59	1,723.03	1,274.81	1,274.81
Finger millet 1		1,064.72	877.78	859.08	840.39
Finger millet 2		2,201.06	1,640.24	1,266.36	1,266.36
Groundnuts 1		1,311.47	1,334.01	860.6	-41.14
Groundnut 2		1,498.2	1,047.33	371.02	-530.72
Maize 1	-231.77	417.93	161.37	-166.09	-296.49
Maize 2	52.60	630.63	52.60	-577.98	-985.23
Pearl millet 1		-954.49	-954.49	-954.49	-954.49
Pearl millet 2		-388.28	-388.28	-396.69	-376.25
Sorghum 1		187.8	122.58	168.23	44.31
Sorghum 2		120.05	120.05	-369.12	-369.12
Sunflower 1		580.21	542.85	328.02	356.04
Sunflower 2		539.38	352.57	72.37	72.37

Table 6.2 Social Profitability for Communal Farm Sector by Agroecological Zone

	Agroecological Zones (Z$/ha)				
	1	2	3	4	5
Burley 1		14,196.55	7,594.32		
Burley 2		4,418.89	-4,960.76		
Cotton 1		2,903.41	2,054.66	1,400.41	1,179.4
Cotton 2		4,671.35	-1,436.53	-1,318.91	-1,318.91
Finger millet 1		1,196.77	1,049.13	1,079.41	1,056.7
Finger millet 2		2,670.99	2,069.06	-401.40	-401.4
Groundnuts 1		5,924.03	6,085.67	4,413.88	1,128.58
Groundnut 2		10,322.76	-7,712.28	-5,977.61	-3,594.05
Maize 1	-326.10	382.78	206.81	-129.33	-325.66
Maize 2	-64.63	129.67	37.73	-28.84	-37.6
Pearl millet 1		-585.70	-506.2	-472.51	-425.61
Pearl millet 2		-1,152.80	118.81	65.81	65.81
Sorghum 1		-558.37	-465.74	-421.93	-396.99
Sorghum 2		-1,360.20	1,400.75	760.10	760.1
Sunflower 1		1,492.07	1,483.88	1,032.62	1,098.4
Sunflower 2			-1,610.09	-1,285.57	-1,285.57

Table 6.3 NPC and EPC for Communal Sector by Agroecological Zone

	NPC	EPC by Agroecological Zone				
	All Zones	1	2	3	4	5
Burley 1	0.88		0.88	0.87		
Burley 2	0.88		0.76	0.73		
Cotton 1	0.82		0.81	0.81	0.80	0.8
Cotton 2	0.82		0.8	-41.59	-38.92	-38.97
Finger millet 1	0.87		0.87	0.87	0.87	0.87
Finger millet 2	0.87		0.87	0.86	-53.99	-54.09
Groundnuts 1	0.36		0.36	0.36	0.35	0.35
Groundnut 2	0.36		0.34	-72.4	-68.21	-54.83
Maize 1	1.05	1.0	1.01	1.0	1.00	1.06
Maize 2	1.06	1.07	-10.21	2.88	36.20	98.08
Pearl millet 1	1.19		1.22	1.22	1.21	1.22
Pearl millet 2	1.19		5.14	157.05	149.76	149.76
Sorghum 1	3.25		365.45	-18.31	-90.68	-4.58
Sorghum 2	3.25		3.22	217.0	316.96	316.96
Sunflower 1	0.58		0.57	0.57	0.57	0.57
Sunflower 2	0.58		0.54	-50.87	-45.69	-45.69

6.3 POLICY INTERVENTIONS ON TRADABLES

Policies affecting output prices have had a taxation effect on sunflower, groundnuts, tobacco, finger millet and cotton, and subsidy effects on maize, sorghum and pearl millet. (Table 6.3) EPC indicate that on the whole sunflower, groundnuts, finger millet and cotton under average farmer practices have been taxed while the same activities under best farmer practices have been subsidized. This suggests that the extra cash inputs used under best farmer practices are heavily subsidized.

EPC results for maize show that it is either slightly subsidized or there are little distortions in its production. Pearl millet and sorghum on the other hand are heavily subsidized.

6.4 COMPARATIVE ADVANTAGE IN THE COMMUNAL SECTOR

RCR analyses indicate that cotton, finger millet, groundnuts and sunflower are highly competitive in the communal sector with RCRs of less than 0.65 in all zones and under both average and best farmer practices. (Table 6.4) Results also show that under average farmer practices burley production is very competitive. Maize, as in other sectors, showed weak competitiveness and only in zones 2 and 3 is it uncompetitive. Pearl millet and sorghum were found to be uncompetitive in all zones.

6.5 SENSITIVITY OF COMPARATIVE ADVANTAGE

Tables 6.5 and 6.7 report results of simulations of changes in yield and world prices that equate RCRs to 1, respectively. Results from the two tables show burley production, under average farmer practices, to be highly competitive; either a decrease of about 70 percent in yield or world prices would make it uncompetitive throughout the country. Similarly cotton, finger millet and groundnuts would require more than a 40 decline in either yield or world prices before they become uncompetitive. At the other extreme are sorghum and pearl millet whose uncompetitiveness is not sensitive to either price or to yield changes. For these crops, it would take changes ranging from 67 to more than 200 percent to make them competitive. The only crop showing sensitivity to either price or yield is maize. In zones 2 and 3, a mere 12 percent decline in yield or world price would make maize uncompetitive.

Table 6.4 RCRs for Communal Farm Sector by Agroecological Zone

	Agroecological Zone				
	1	2	3	4	5
Burley 1		0.33	0.53		
Burley 2		0.85	-3.88		
Cotton 1	1.41	0.52	0.57	0.62	0.65
Cotton 2	1.09	0.50	0.54	0.57	0.57
Finger millet 1		0.45	0.44	0.42	0.42
Finger millet 2		0.40	0.41	0.43	0.43
Groundnuts 1		0.20	0.19	0.20	0.38
Groundnut 2		0.24	0.25	0.29	0.42
Maize 1		0.88	0.93	1.17	1.80
Maize 2		0.89	1.05	1.54	3.15
Pearl millet 1		2.82	2.59	2.18	3.21
Pearl millet 2		15.07	14.39	13.95	13.95
Sorghum 1		355.80	-17.47	-77.33	-4.49
Sorghum 2		3.19	3.07	3.10	3.10
Sunflower 1		0.40	0.37	0.39	0.38
Sunflower 2		0.44	0.45	0.49	0.49

Table 6.5 COM: Percentage Change in Yield That Makes Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zone(%)				
	1	2	3	4	5
Burley 1		-72.96	-63.09		
Burley 2		-14.68	24.75		
Cotton 1		-44.93	-40.57	-35.0	-32.22
Cotton 2		-46.75	-39.75	-37.2	-37.20
Finger millet 1		-53.85	-54.83	-57.35	-57.15
Finger millet 2		-57.69	-55.84	-49.11	-49.11
Groundnuts 1		-79.59	-80.75	-79.06	-60.63
Groundnut 2		-73.95	-70.03	-65.98	-53.06
Maize 1	36.19	-11.17	-6.90	14.95	72.00
Maize 2	5.77	-10.23	-0.41	24.61	71.09
Pearl millet 1		168.9	147.02	109.27	203.06
Pearl millet 2		167.99	97.55	92.73	92.73
Sorghum 1		215.0	208.37	176.87	216.36
Sorghum 2		227.94	83.20	128.38	128.38
Sunflower 1		-59.29	-61.89	-60.14	-60.82
Sunflower 2		-52.18	-46.15	-41.51	-41.51

Table 6.6 COM: Percentage Change in World Price That Makes Crop Competitive(+), or Uncompetitive(-)

	Agroecological Zone				
	1	2	3	4	5
Burley 1		-71.83	-62.12		
Burley 2		-14.46	24.35		
Cotton 1	25.01	-42.92	-38.77	-33.47	-30.75
Cotton 2	1.78	-44.66	-39.75	-37.20	-37.20
Finger millet 1		-48.95	-49.83	-52.11	-51.86
Finger millet 2		-52.43	-50.77	-49.11	-49.11
Groundnuts 1		-76.96	-78.08	-76.45	-58.65
Groundnut 2		-71.52	-70.03	-65.98	-53.06
Maize 1		-10.87	-7.63	8.93	52.27
Maize 2		-10.23	-0.41	24.61	71.09
Pearl millet 1		106.46	92.01	67.10	128.94
Pearl millet 2		104.77	97.55	92.73	92.73
Sorghum 1		84.64	81.46	66.63	85.16
Sorghum 2		88.37	83.20	128.38	128.38
Sunflower 1		-53.66	-56.00	-54.42	-55.04
Sunflower 2		-47.31	-46.15	-41.51	-41.51

7. Summary and Conclusion

The analysis of this study indicates which regions are economically suitable for the production of particular crops. The importance of this is that it helps governments and development workers put scarce resources into the development of crops with the highest social benefits. Also, because of the spatial aspect of the study, this information is available on a region by region basis. A second important outcome of this study is that it helps us identify and quantify the effects of current government policies on the production of individual crops. Having figures backed by a clear method helps in debates on policy measures.

The following sections discuss in turn the implications of our analyses on economically suitable enterprises in the different sectors and provinces of Zimbabwe and highlights of some policy effects.

7.1 ECONOMICALLY SUITABLE CROPS BY SECTOR

To evaluate which crops should receive attention in different sectors and provinces, RCR's of crops grown in different sectors were ranked. Table 7.1 summarizes the best crops (economically) for the different sectors and provinces. The following sections discuss these results by sector.

Table 7.1 Ranking of RCRs in Sector by Agroecological Zone

Sector	Agroecological Zone				
	1	2	3	4	5
LSC	Groundnuts Burley Tobacco Cotton Soyabeans Sunflower Virginia Tobacco Wheat Maize	Groundnuts Paprika Sunflower Virginia Tobacco Cotton Burley Tobacco Wheat Barley Soyabeans Maize	Groundnuts Sunflower Virginia Tobacco Wheat Burley Tobacco Cotton Paprika Soyabeans Barley	Sunflower Groundnuts Virginia Tobacco Paprika Barley Cotton Wheat	Sunflower Wheat Barley Paprika Cotton
SSC	Groundnuts Maize	Groundnuts Sunflower Maize	Groundnuts Sunflower Groundnuts	Groundnuts Sunflower	Groundnuts Sunflower
COM		Groundnuts Sunflower Finger millet Cotton Burley Tobacco Maize	Sunflower Finger millet Cotton Maize	Groundnuts Sunflower Finger millet Cotton	Groundnuts Sunflower Finger millet Cotton

7.1.1 Large Scale Commercial

For the large scale commercial sector Table 7.1 reveals a number of observations. The most competitive crop is groundnuts, which ranks first in zones 1, 2 and 3 and second in zone 4. Ranked relatively low in zone 1, sunflower and Virginia tobacco become relatively more competitive as we move towards drier ecological zones. Sunflower, in particular, becomes the most competitive in zones 4 and 5. Maize, despite taking the lion's share of cultivated land, is only competitive in zones 1 and 2. Further, in both zones it ranks last in its efficiency in use of domestic resources.

The above information indicates that the emphasis on maize production might not be warranted. Indeed, results reported in section 4 showed maize has been subsidized while most other crops have been taxed. We would expect removal of distortions to boost production of these crops at the expense of maize. One other observation from Table 7.1 is the high number of crops in each zone that are economically viable in the small scale commercial sector compared to the other sectors. This gives this sector more options of diversification without compromising economic efficiency. In the other sectors this is only possible in agroecological zone 2.

7.1.2 Small Scale Commercial

In the small scale commercial sector only three crops, groundnuts, sunflower and maize, were found to be competitive based on average farmer practices. In all zones the most efficient resource use was groundnuts followed by sunflower. Maize was found to be efficient only in zone 2. This is a very surprising result in that the widely held view is that production technology used by farmers in this sector is at least similar to that in the communal sector and farmers in this sector are not constrained for land. Further, about 40 percent of farmers in this sector have a title to land implying they can use land as collateral to borrow from financial institutions, an advantage not enjoyed by communal sector farmers. A possible explanation for the better performance of communal relative to this sector is that because land is not a constraint. There is a tendency to use more land for a given amount of other inputs resulting in fewer net returns per unit of land compared to the communal sector.

7.1.3 Communal Sector

Like in other sectors, the most efficient crop in the communal sector is groundnuts followed by sunflower, finger millet and cotton in all zones. In zone 2 burley tobacco and maize were competitive. Maize also enters the list of competitive crops in zone 3.

7.2 HIGHLIGHTS OF POLICY EFFECTS

This sector looks beyond the RCR results (presented in the preceding section) as it attempts to extrapolate the implications of the results to three farming sectors (LSC, COM and SSC) with respect to observed/ calculated net policy effect. The bottom line concern is to assess how these results can be used to: guide and promote the investment drive within the agricultural sector; positively impact agricultural production and refining current agricultural policies and practices. The post-reform policy emphasis of the government (Ministry of Agriculture 1997/98 policy statement) rests on transforming the smallholder agriculture into a fully commercialized farming sector. The global objective is to achieve an agricultural growth rate each year which outstrips the annual population growth rate estimated as 3.2 percent. In this nerve, what do the RCR results imply and what insights can be derived and advocated?

A common result highlighted by the NPC and EPC discussed in sections 4 to 6 is that the agricultural sector is heavily taxed. Implications here are that cash crops (soyabeans, groundnuts, tobacco, cotton and sunflower) tend to be heavily taxed. The burden of the taxes is felt by farmers in all sectors. Small scale commercial farmers are the dominant producers of tobacco and soyabeans while small scale commercial and communal farmers produce most of sunflower, groundnuts and cotton. Maize, sorghum and pearl millet are subsidized which explain their continued production across most zones.

An important issue worthy investigation is to measure the extent to which the taxed funds are ploughed back into the agricultural sector in the form of research, institutional support and development for this sector. A simple illustration using the results in Tables 4.1, 4.2, 6.1 and 6.2 indicate that on average both large scale and communal farmers are taxed about $1,447.78 per hectare of cotton produced. Thus, using the cotton hectarage levels of 248,000 achieved during the 1993/94 farming season, one can estimate that the government realized a revenue of Z$359.05 million from cotton producers. Allocated total agricultural research budget for 1993/94 was only Z$37.56 million (Tawonezvi, 1995) or a tenth of revenue generated only from cotton producers. In a nutshell, very little of the amount generated through taxation of agriculture has been re-invested into agricultural sector support institutions such as research and extension.

Pan-territorial pricing system has been in place for decades. This system has created severe distortions as it has resulted in net subsidization of farmers in regions remote from main consumption centers. Most of the subsidies on grain crops discussed above are due to pan-territorial pricing. Even though the government is now only setting floor prices and not market prices of grain, these prices may be more than efficiency prices in very remote areas. Further, liberalization has put the whole burden of subsidy on the government. When the government controlled all grain marketing, it was possible for it to tax farmers near markets to subsidize those in remote areas. Liberalization has thus removed these cross subsidization possibilities.

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Appendix 1

Communal Sector Budgets

Burley 1 (average farmer practices)

Agroecological Zone		**2**	**3**
Yield(ton/ha)	tons/ ha	0.97	0.60
Inputs and prices(Z$) Ex-Harare per Ha			
Seed(kgs)	quantity(kgs)	0.03	0.03
	ex-Harare price	17,600.00	17,600.00
Compound C Fertilizer	kgs	700.00	700.00
	ex-Harare price	2.32	2.32
Ammonium Nitrate	kgs	90.00	90.00
	ex-Harare price	1.97	1.97
Pre Harvest labor	hrs/ha	360.00	360.00
	ex-Harare price	0.98	0.98
Harvest Labor	hrs/kg	0.40	0.40
	hrs/ha	400.00	400.00
Hessian wrap	$36/ton	36.00	36.00
Paper rolls	$36/ton	36.00	36.00
T9 string	rolls per ton	8.00	8.00
	price/roll	40.00	40.00
Price levy	1c/kg	10.00	10.00
Auction	$4.5/100kgs	45.00	45.00
Commission	3%	540.00	540.00
Floor fees	2%	360.00	360.00
Land cost	per ha	159.00	159.00

Burley 2 (best farmer practices)

Agroecological Zone		**2**	**3**
Yield(ton/ha)	tons/ ha	1.50	1.00
Inputs and prices(Z$) Ex-Harare per Ha			
Seed	kg	0.01	0.01
	ex-Harare price	17,600.00	17,600.00
Compound C Fertilizer	kg	750.00	750.00
	ex-Harare price	2.32	2.32
Ammonium Nitrate	kg	202.00	202.00
	ex-Harare price	1.97	1.97
Compound S Fertilizer	tons	0.01	0.01
	ex-Harare price	2,220.00	2,220.00
Lime	tons	0.70	0.70
	ex-Harare price	360.00	360.00
EDB	liter	50.00	50.00
	ex-Harare price	46.50	46.50
Copper Oxychloride	kg	0.50	0.50
	ex-Harare price	33.33	33.33
Dimethoate 40	litres	0.50	0.50

	ex-Harare price	72.00	72.00
Dursban	litres	0.50	0.50
	ex-Harare price	180.00	180.00
Accotab	Litres	3.00	3.00
	ex-Harare price	72.50	72.50
Pre-Harvest labor	hrs/ha	360.00	360.00
	price	0.98	0.98
Harvest Labor	hrs/kg	0.40	0.40
	hrs/ha	600.00	600.00
Hessian wrap	$36/ton	54.00	54.00
Paper rolls	$36/ton	54.00	54.00
T9 string	rolls per ton	8.00	8.00
	price/roll	40.00	40.00
price levy	1c/kg	15.00	15.00
Auction	$4.5/100kgs	67.50	67.50
Commission	3%	810.00	810.00
Floor fees	2%	540.00	540.00
Land cost	per ha	159.00	159.00

Cotton 1

Agroecological Zone		**2**	**3**	**4**	**5**
Yield(tons/ha)		0.97	0.76	0.6	0.55
Inputs and prices(Z$) Ex-Harare per Ha					
Seed (K502)	kgs	20.00	20.00	20.00	20.00
	ex-Harare price	7.00	7.00	7.00	7.00
Compound L Fertilizer	kgs	100.00	100.00	100.00	100.00
	ex-Harare price	1.99	1.99	1.99	1.99
Ammonium Nitrate	Kgs	75.00	75.00	75.00	75.00
	ex-Harare price	1.97	1.97	1.97	1.97
Carbaryl	kgs	1.00	1.00	1.00	1.00
	ex-Harare price	88.00	88.00	88.00	88.00
Dimethoate	litres	1.00	1.00	1.00	1.00
	ex-Harare price	58.00	58.00	58.00	58.00
Molassis	litres	10.00	10.00	10.00	10.00
	ex-Harare price	0.90	0.90	0.90	0.90
Pre-harvest Labor	hrs/ha	404.00	404.00	404.00	404.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	1.70	1.70	1.70	1.70
	hrs/ha	1,700.00	1,190.00	2,040.00	1,360.00
Packaging	bags/t	5.00	5.00	5.00	5.00
	price/bag	53.96	53.96	53.96	53.96
	cost/ha	269.80	188.86	323.76	215.84
Twine	kgs/t	0.13	0.13	0.13	0.13
	price/kg	24.75	24.75	24.75	24.75
Land cost	Z$/ha	159.00	79.50	26.50	26.50

Cotton 2

Agroecological Zone		**2**	**3**	**4**	**5**
Yield(tons/ha)		1.50	1.14	1.00	1.00
Inputs and prices(Z$) Ex-Harare per Ha					
Seed	kg	25.00	25.00	25.00	25.00
	ex-Harare price	7.00	7.00	7.00	7.00
Compound L Fertilizer	kg	200.00	200.00	150.00	150.00
	ex-Harare price	1.99	1.99	1.99	1.99
Ammonium Nitrate	kg	50.00	50.00	50.00	50.00
	ex-Harare Price	1.97	1.97	1.97	1.97
Carbaryl	kg	3.00	3.00	3.00	3.00
	ex-Harare price	88.00	88.00	88.00	88.00
Karate	litres	0.50	0.50	0.50	0.50
	ex-Harare price	179.00	179.00	179.00	179.00
Dimethoate	litres	1.00	1.00	1.00	1.00
	ex-Harare price	58.00	58.00	58.00	58.00
Thiodan	kg	2.00	2.00	2.00	2.00
	ex-Harare price	97.80	97.80	97.80	97.80
Molassis	litres	10.00	10.00	10.00	10.00
	ex-Harare price	0.90	0.90	0.90	0.90
Pre-harvest Labor	hrs/ha	404.00	404.00	404.00	404.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	1.70	1.70	1.70	1.70
	hrs/ha	2,550.00	2,040.00	2,550.00	2,550.00
Packaging	bags/t	5.00	5.00	5.00	5.00
	price/bag	53.96	53.96	53.96	53.96
Twine	kgs/t	0.13	0.13	0.13	0.13
	price/kg	24.75	24.75	24.75	24.75
Land	per ha	159.00	79.50	26.50	26.50

Finger Millet 1

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	0.72	0.62	0.61	0.60
Inputs and prices(Z$) Ex-Harare per Ha					
Seed	kgs	14.00	14.00	14.00	14.00
	ex-Harare price	3.00	3.00	3.00	3.00
Pre harvest labor	hrs/ha	200.00	200.00	200.00	200.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.60	0.60	0.60	0.60
	hrs/ha	360.00	240.00	300.00	360.00
Packaging	bags per ton	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.5
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land Cost	per ha	159.00	79.5	26.50	26.50

Finger Millet 2

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	1.50	1.20	1.00	1.00
Inputs and prices(Z$) Ex-Harare per Ha					
Seed	kg	5.00	5.00	5.00	5.00
Compound D Fertilizer	kg	100.00	100.00	100.00	100.00
	ex-Harare price	1.60	1.60	1.60	1.60
Ammonium Nitrate	kg	130.00	100.00	100.00	50.00
	ex-Harare price	1.97	1.97	1.97	1.97
Pre harvest labor	hrs/ha	200.00	200.00	200.00	200.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.60	0.60	0.60	0.60
	hrs/ha	600.00	600.00	480.00	600.00
Packaging	bags per ton	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land	per ha	159.00	79.50	26.50	26.50

Groundnut 1

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	0.80	0.81	0.60	0.20
Inputs and prices(Z$) Ex-Harare per Ha					
Seed	kgs	35.00	35.00	35.00	35.00
Pre-Harvest labor	hrs/ha	300.00	300.00	300.00	300.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.85	0.85	0.85	0.85
Packaging	bags per ton	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land cost	per ha	159.00	79.50	26.50	26.50

Groundnut 2

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	1.50	1.30	1.00	0.60
Inputs and prices(Z$) Ex-Harare per Ha					
Seed	kg	100.00	100.00	100.00	100.00
	ex-Harare price	8.00	8.00	8.00	8.00
Single Super Phosphate	kg	200.00	200.00	200.00	200.00
	ex-Harare price	1.20	1.20	1.20	1.20
Gpsum	kgs	200.00	200.00	200.00	200.00
	ex-Harare price	0.36	0.36	0.36	0.36
Dimethoate 40	litres	1.00	1.00	1.00	1.00
	ex-Harare price	58.00	58.00	58.00	58.00
Pre-harvest labor	hrs/ha	300.00	300.00	300.00	300.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/ha	0.85	0.85	0.85	0.85
Packaging	bags per ton	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land cost	per ha	159.00	79.50	26.50	26.50

Maize 1

Agroecological zone		**1**	**2**	**3**	**4**	**5**
Yield: highest area yiel	(t/ha)	0.90	2.43	1.87	1.00	0.43
Inputs and prices (Z$) Ex-Harare per Ha						
Seed	kgs	24.00	24.00	24.00	24.00	24.00
	ex-Harare price	4.96	4.96	4.96	4.96	4.96
Cpd D	kgs	50.00	150.00	100.00	50.00	0
	ex-Harare price	1.60	1.60	1.60	1.60	1.6
AN	kgs	50.00	100.00	100.00	50.00	0
	ex-Harare price	1.97	1.97	1.97	1.97	1.97
Pre-harvest labor	hrs/ha	380.00	380.00	380.00	380.00	380.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.32	0.32	0.32	0.32	0.32

Appendix 2

Large Scale Commercial Budgets

Barley						
Agroeological Zone		**1**	**2**	**3**	**4**	**5**
Yield:	Irrigated (t/ha)	2.26	3.43	2.50	3.00	3.50
Inputs and ex-Harare Prices (Z$)						
Preharvesting labor		16.62	16.62	16.62	16.62	16.62
Financial labor	Price($/ld)	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	74.90	74.90	74.90	74.90	74.90
	price	2.63	2.63	2.63	2.63	2.63
	Transport	0.41	0.45	0.19	0.19	0.19
Seed	kgs	100.00	100.00	100.00	100.00	100.00
	price	3.58	3.58	3.58	3.58	3.58
Compound D	tons	0.45	0.45	0.45	0.45	0.45
	price	1,604.00	1,604.00	1,604.00	1,604.00	1,604.00
Ammonium Nitrate	Tons	0.35	0.35	0.35	0.35	0.35
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
Lime	Tons	0.40	0.40	0.40	0.40	0.40
	Price	360.00	360.00	360.00	360.00	360.00
MCPA	liters	1.00	1.00	1.00	1.00	1.00
	price	45.00	45.00	45.00	45.00	45.00
Buctril	liters	2.00	2.00	2.00	2.00	2.00
	price	84.83	84.83	84.83	84.83	84.83
Monocrotophos	liters	0.50	0.50	0.50	0.50	0.50
	price	85.00	85.00	85.00	85.00	85.00
Irrigation	Cub. m	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
	price	0.30	0.30	0.30	0.30	0.30
Insurance as % of gross income		5.35	5.35	5.35	5.35	5.35
Harvest labor	lds/t	0.50	0.50	0.50	0.50	0.50
	price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	ld/t	1.30	1.30	1.30	1.30	1.30
	price/ld	14.21	14.21	14.21	14.21	14.21
Contract combine	cost	410.00	410.00	410.00	410.00	410.00
Artificial drying(coal)	kgs/t	8.00	8.00	8.00	8.00	8.00
	price/kg	0.34	0.34	0.34	0.34	0.34
Electricity	Kwh/t	0.30	0.30	0.30	0.30	0.30
	price/kwh	5.11	5.11	5.11	5.11	5.11
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	Z$/ha	742.00	742.00	212.00	26.50	26.50

Burley Tobacco

Agroecological Zone		**1**	**2**	**3**
Yields	t/ha	2.00	1.35	1.13
Inputs and ex-Harare Prices (Z$)				
Preharvest labor	labor days	88.00	88.00	88.00
	Price($/ld)	14.21	14.21	14.21
Tractor and equipment	lts	140.00	140.00	140.00
	price	2.63	2.63	2.63
	Transport	0.41	0.45	0.45
Seed	grams	6.00	6.00	6.00
	price	17.60	17.60	17.60
Compound C	tons	0.80	0.80	0.80
	price	2,315.00	2,315.00	2,315.00
Ammonium Nitrate	Tons	0.50	0.50	0.50
	Price	1,970.00	1,970.00	1,970.00
Lime	Tons	0.70	0.70	0.70
	Price	360.00	360.00	360.00
Compound S	tons	0.01	0.01	0.01
	price	2,220.00	2,220.00	2,220.00
Copper Oxychloride	kg	0.50	0.50	0.50
	price	33.33	33.33	33.33
Orthene	kgs	0.50	0.50	0.50
	price	256.00	256.00	256.00
EDB	liter	50.00	50.00	50.00
	Price	46.50	46.50	46.50
Dimethoate	liters	0.50	0.50	0.50
	Price	72.00	72.00	72.00
Dursban	liters	0.50	0.50	0.50
	Price	180.00	180.00	180.00
Accotab	Liters	3.00	3.00	3.00
	price	72.50	72.50	72.50
Insurance (% of gross income)		9.50	9.50	9.50
Harvest labor	lds	120.00	120.00	120.00
	price	14.21	14.21	14.21
Tractor plus equipment	liters	70.00	70.00	70.00
minus harvest	price	2.63	2.63	2.63
Hessian Wrap	$/ton	36.00	36.00	36.00
Paper rolls	$/ton	36.00	36.00	36.00
T9 string	rolls/ ton	8.00	8.00	8.00
	price/roll	40.00	40.00	40.00
Price levy	$/kg	0.01	0.01	0.01
Auction	$/kg	0.05	0.05	0.05
Commission	3%	3.00	3.00	3.00
Floor fees	2%	2.00	2.00	2.00
Land cost	$/ha	742.00	742.00	212.00

Cotton

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	1.50	1.40	1.10	0.90	0.90
Inputs and ex-Harare Prices (Z$)						
Preharvesting labor	lds	38.42	38.42	38.42	38.42	38.42
	Price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	70.40	70.40	70.40	70.40	70.40
	price	2.63	2.63	2.63	2.63	2.63
	Transport	0.05	0.05	0.05	0.05	0.05
Seed	kgs	25.00	25.00	25.00	25.00	25.00
	price	7.00	7.00	7.00	7.00	7.00
Compound L	tons	0.30	0.25	0.25	0.25	0.25
	price	1,990.00	1,990.00	1,990.00	1,990.00	1,990.00
Ammonium Nitrate(AN)	Tons	0.10	0.05	0.05	0.05	0.05
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
Lime	Tons	0.25	0.25	0.25	0.25	0.25
	Price	360.00	360.00	360.00	360.00	360.00
AN Application	$/ha	102.86	102.86	102.86	102.86	102.86
Trifluralin Pre-emergence	liters	1.60	1.60	1.60	1.60	1.60
	price	61.00	61.00	61.00	61.00	61.00
Cynazine 50sc	liters	3.10	3.10	3.10	3.10	3.10
post-emerge	price	95.00	95.00	95.00	95.00	95.00
Paraquat 25EC	liters	1.00	1.00	1.00	1.00	1.00
	price	86.00	86.00	86.00	86.00	86.00
Endosulfan 35MO	liters	2.50	2.50	2.50	2.50	2.50
	price	137.00	137.00	137.00	137.00	137.00
Carbaryl 85wp	kgs	2.50	2.50	2.50	2.50	2.50
	Price	88.00	88.00	88.00	88.00	88.00
Molasses	liters	5.00	5.00	5.00	5.00	5.00
	price	0.90	0.90	0.90	0.90	0.90
Hostathion	liters	1.00	1.00	1.00	1.00	1.00
	price	179.00	179.00	179.00	179.00	179.00
Marshal	liters	0.50	0.50	0.50	0.50	0.50
	price	80.40	80.40	80.40	80.40	80.40
Tetradifon	liters	1.20	1.20	1.20	1.20	1.20
	price	41.00	41.00	41.00	41.00	41.00
Application	cost	650.00	650.00	650.00	650.00	650.00
Insurance(% of gross income)		0.57	0.57	0.57	0.57	0.57
Harvest labor		1.83	1.83	1.83	1.83	1.83
	price	14.21	14.21	14.21	14.21	14.21
Tractor plus equipment	ld/t	0.28	0.28	0.28	0.28	0.28
minus harvesting	price/ld	14.21	14.21	14.21	14.21	14.21
Packaging	bags/t	5.00	5.00	5.00	5.00	5.00
	price/bag	53.96	53.96	53.96	53.96	53.96
Twine	kgs/t	0.13	0.13	0.13	0.13	0.13
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	742.00	742.00	212.50	26.50	26.50

Virginia Tobacco

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	1.27	1.95	1.54	1.25	0.45
Inputs and ex-Harare Prices						
Pre-harvesting labor	ld	150.00	150.00	150.00	150.00	150.00
	price($/ld)	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	136.00	136.00	136.00	136.00	136.00
	price	2.63	2.63	2.63	2.63	2.63
Seed	grams	6.00	6.00	6.00	6.00	6.00
	price	17.60	17.60	17.60	17.60	17.60
Compound C	tons	0.65	0.65	0.65	0.65	0.65
	price	2,315.00	2,315.00	2,315.00	2,315.00	2,315.00
Ammonium Nitrate	tons	0.08	0.08	0.08	0.08	0.08
	price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
LIME	tons	0.60	0.60	0.60	0.60	0.60
	price	360.00	360.00	360.00	360.00	360.00
Compound S	tons	0.01	0.01	0.01	0.01	0.01
	price	2,220.00	2,220.00	2,220.00	2,220.00	2,220.00
Nitrate of Soda	tons	0.08	0.08	0.08	0.08	0.08
	price	2,800.00	2,800.00	2,800.00	2,800.00	2,800.00
Methyl Bromide	kg	7.50	7.50	7.50	7.50	7.50
	price	48.40	48.40	48.40	48.40	48.40
Copper Oxychloride	kg	0.96	0.96	0.96	0.96	0.96
	price	33.33	33.33	33.33	33.33	33.33
Triadimenol	kg	0.79	0.79	0.79	0.79	0.79
	price	368.35	368.35	368.35	368.35	368.35
Monochotophos	liters	2.60	2.60	2.60	2.60	2.60
	price	54.62	54.62	54.62	54.62	54.62
Orthene	kgs	0.25	0.25	0.25	0.25	0.25
	price	256.00	256.00	256.00	256.00	256.00
Anilazine	kgs	5.64	5.64	5.64	5.64	5.64
	price	195.31	195.31	195.31	195.31	195.31
Mancozeb	liters	0.10	0.10	0.10	0.10	0.10
	price	70.00	70.00	70.00	70.00	70.00
EDB	liter	12.00	12.00	12.00	12.00	12.00
	price	46.50	46.50	46.50	46.50	46.50
Chrorpyrifos	liters	0.78	0.78	0.78	0.78	0.78
	price	144.87	144.87	144.87	144.87	144.87
Fenvalerate	liters	0.10	0.10	0.10	0.10	0.10
	price	160.00	160.00	160.00	160.00	160.00
Metolachlor	liters	3.00	3.00	3.00	3.00	3.00
	price	110.33	110.33	110.33	110.33	110.33
N'Decanol	liters	8.00	8.00	8.00	8.00	8.00
	price	41.88	41.88	41.88	41.88	41.88
Harvest labor	lds	360.00	360.00	360.00	360.00	360.00
	price	14.21	14.21	14.21	14.21	14.21
Tractor plus equipment	liters	50.00	50.00	50.00	50.00	50.00
minus harvest	price	2.63	2.63	2.63	2.63	2.63
Coal per ton harvested	ton	4.40	4.40	4.40	4.40	4.40
	price	585.31	585.31	585.31	585.31	585.31

Packaging	per ton	135.33	135.33	135.33	135.33	135.33
Commission(2.5% of Gross Income)		2.50	2.50	2.50	2.50	2.50
Price levy(.875 % of Gross Income)		0.88	0.88	0.88	0.88	0.88
Yield levy	cents/kg	0.88	0.88	0.88	0.88	0.88
Land economic cost		742.00	742.00	212.50	212.50	212.50

Groundnuts

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
YIELD t/ha		1.42	2.34	1.10	0.64	0.37
Inputs and ex-Harare Price(Z$)						
Pre-harvest labor	lds	13.01	13.01	13.01	13.01	13.01
	Price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	75.90	75.90	75.90	75.90	75.90
	price	2.63	2.63	2.63	2.63	2.63
Seed	kgs	100.00	100.00	100.00	100.00	100.00
	price	8.00	8.00	8.00	8.00	8.00
Innoculant	lts	0.15	0.15	0.15	0.15	0.15
	price	25.00	25.00	25.00	25.00	25.00
Compound L	tons	0.25	0.25	0.25	0.25	0.25
	price	1,990.00	1,990.00	1,990.00	1,990.00	1,990.00
Gypsum	Tons	0.40	0.40	0.40	0.40	0.40
	Price	360.00	360.00	360.00	360.00	360.00
LIME	Tons	0.30	0.30	0.30	0.30	0.30
	Price	360.00	360.00	360.00	360.00	360.00
Gesagard 500FW	liters	3.00	3.00	3.00	3.00	3.00
	price	100.00	100.00	100.00	100.00	100.00
Metalochor	liters	2.00	2.00	2.00	2.00	2.00
	price	113.00	113.00	113.00	113.00	113.00
Monochrotophos 40EC	liters	1.20	1.20	1.20	1.20	1.20
	price	78.00	78.00	78.00	78.00	78.00
Labor – loosen,lift,stack	lds	11.56	11.56	11.56	11.56	11.56
	price	14.21	14.21	14.21	14.21	14.21
Labor – pick,market	lds	7.01	7.01	7.01	7.01	7.01
	price	14.21	14.21	14.21	14.21	14.21
Machinery – loosen,	lts	8.80	8.80	8.80	8.80	8.80
lift stack	price	2.63	2.63	2.63	2.63	2.63
Machinery - pick,market	ld/t	3.30	3.30	3.30	3.30	3.30
	price/ld	14.21	14.21	14.21	14.21	14.21
Contract Shelling	$/t	280.00	280.00	280.00	280.00	280.00
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land econ cost	$/ha	742.00	742.00	212.50	26.50	26.50

Maize

Commercial		**1**	**2**	**3**	**4**	**5**
Yield: Dryland		4.90	4.50	3.00	1.50	1.90
Inputs and ex-Harare Prices(Z$)						
Pre-harvesting labor	lds	10.57	10.57	10.57	10.57	10.57
	price($/ld)	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	62.20	62.20	62.20	62.20	62.20
	price	2.63	2.63	2.63	2.63	2.63
	Transport	0.41	0.45	0.19	0.19	0.19
Seed	kgs	25.00	25.00	25.00	25.00	25.00
	price	4.96	4.96	4.96	4.96	4.96
Compound D	tons	0.35	0.30	0.25	0.25	0.25
	price	1,600.00	1,600.00	1,600.00	1,600.00	1,600.00
Ammonium Nitrate	Tons	0.30	0.30	0.20	0.20	0.20
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
LIME	Tons	0.25	0.25	0.25	0.25	0.25
	Price	360.00	360.00	360.00	360.00	360.00
AN Application	Fixed	102.86	102.86	102.86	102.86	102.86
Dual 720(lt)	liters	2.00	2.00	2.00	2.00	2.00
	price	105.00	105.00	105.00	105.00	105.00
Atrazine(lt)	liters	2.80	2.80	2.80	2.80	2.80
	price	43.00	43.00	43.00	43.00	43.00
Dimathoate 40	liters	2.00	2.00	2.00	2.00	2.00
	price	58.00	58.00	58.00	58.00	58.00
Harvest labor	lds/t	0.08	0.08	0.08	0.08	0.08
	price	14.21	14.21	14.21	14.21	14.21
Tractor plus equipment	ld/t	1.21	1.21	1.21	1.21	1.21
minus harvest	price/ld	14.21	14.21	14.21	14.21	14.21
Contract combine	$/ha	360.00	360.00	360.00	360.00	360.00
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land economic cost	$/ha	742.00	742.00	212.50	26.50	26.50

Paprika

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	0.65	1.80	1.00	1.00	1.00
Inputs and ex-Harare Prices (Z$)						
Labor	lds	465.00	465.00	465.00	465.00	465.00
	Price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	50.00	50.00	50.00	50.00	50.00
	price	2.63	2.63	2.63	2.63	2.63
Seed	kgs	0.35	0.35	0.35	0.35	0.35
	price	500.00	500.00	500.00	500.00	500.00
Compound L	tons	0.70	0.70	0.70	0.70	0.70
	price	1,990.00	1,990.00	1,990.00	1,990.00	1,990.00
Ammonium Nitrate	Tons	0.30	0.30	0.30	0.30	0.30
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
Compound S	Tons	0.20	0.20	0.20	0.20	0.20
	Price	2,220.00	2,220.00	2,220.00	2,220.00	2,220.00
Muriate of Potash	tons	0.40	0.40	0.40	0.40	0.40
	price	2,240.00	2,240.00	2,240.00	2,240.00	2,240.00
Trifluralin	liters	1.80	1.80	1.80	1.80	1.80
	price	61.00	61.00	61.00	61.00	61.00
Lasso	liters	4.00	4.00	4.00	4.00	4.00
	price	44.50	44.50	44.50	44.50	44.50
Gramoxone	liters	1.00	1.00	1.00	1.00	1.00
	price	82.00	82.00	82.00	82.00	82.00
EDB	liter	17.50	17.50	17.50	17.50	17.50
	price	40.50	40.50	40.50	40.50	40.50
Vydate	liters	6.00	6.00	6.00	6.00	6.00
	price	162.50	162.50	162.50	162.50	162.50
Methyl Bromide	kgs	7.00	7.00	7.00	7.00	7.00
	price	50.00	50.00	50.00	50.00	50.00
Trichomerda	kgs	10.00	10.00	10.00	10.00	10.00
	price	24.00	24.00	24.00	24.00	24.00
Copper Oxychloride	liters	1.34	1.34	1.34	1.34	1.34
	price	22.36	22.36	22.36	22.36	22.36
Dithane 45	kg	3.63	3.63	3.63	3.63	3.63
	price	64.00	64.00	64.00	64.00	64.00
Captan	kg	1.12	1.12	1.12	1.12	1.12
	price	65.00	65.00	65.00	65.00	65.00
Orthene	kg	0.64	0.64	0.64	0.64	0.64
	price	216.00	216.00	216.00	216.00	216.00
Bayfidan	kg	1.00	1.00	1.00	1.00	1.00
	price	345.00	345.00	345.00	345.00	345.00
Karate	liters	0.30	0.30	0.30	0.30	0.30
	price	179.00	179.00	179.00	179.00	179.00
Metasystox	kg	0.80	0.80	0.80	0.80	0.80
	price	78.00	78.00	78.00	78.00	78.00
Land Cost	$/ha	742.00	742.00	742.00	742.00	742.00

Red Sorghum

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	5.00	4.00	3.14	2.40	2.00
Inputs and ex-Harare Prices (Z$)						
Pre-harvesting labor	lds	10.41	10.41	10.41	10.41	10.41
	Price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	57.80	57.80	57.80	57.80	57.80
	price	2.63	2.63	2.63	2.63	2.63
Seed	kgs	10.00	10.00	10.00	10.00	10.00
	price	6.00	6.00	6.00	6.00	6.00
Compound D	tons	0.30	0.25	0.25	0.25	0.25
	price	1,600.00	1,600.00	1,600.00	1,600.00	1,600.00
Ammonium Nitrate(AN)	Tons	0.25	0.20	0.15	0.15	0.15
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
LIME	Tons	0.25	0.25	0.25	0.25	0.25
	Price	360.00	360.00	360.00	360.00	360.00
AN Application	Fixed	102.86	102.86	102.86	102.86	102.86
Dual 720(lt)	liters	2.00	2.00	2.00	2.00	2.00
	price	105.00	105.00	105.00	105.00	105.00
Atrazine(lt)	liters	2.50	2.50	2.50	2.50	2.50
	price	43.00	43.00	43.00	43.00	43.00
Dimathoate 40	liters	2.00	2.00	2.00	2.00	2.00
	price	58.00	58.00	58.00	58.00	58.00
Carbaryl 85wp	kgs	1.00	1.00	1.00	1.00	1.00
	price	88.00	88.00	88.00	88.00	88.00
Molasses	liters	10.00	10.00	10.00	10.00	10.00
	price	0.90	0.90	0.90	0.90	0.90
Harvest labor		0.08	0.08	0.08	0.08	0.08
	price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	ld/t	1.21	1.21	1.21	1.21	1.21
minus harvest	price/ld	14.21	14.21	14.21	14.21	14.21
Contract Combine	$/ha	360.00	360.00	360.00	360.00	360.00
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land economic cost	$/ha	742.00	742.00	742.00	742.00	742.00

Soyabeans

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	2.13	1.44	1.32	0.80	0.80
Inputs and ex-Harare Prices (Z$)						
Pre harvesting labor	lds	8.50	8.50	8.50	8.50	8.50
	price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	263.00	263.00	263.00	263.00	263.00
	price	2.63	2.63	2.63	2.63	2.63
	Transport	0.41	0.45	0.19	0.19	0.19
Seed	kgs	100.00	100.00	100.00	100.00	100.00
	price	4.60	4.60	4.60	4.60	4.60
LIME	Tons	0.25	0.25	0.25	0.25	0.25
	Price	360.00	360.00	360.00	360.00	360.00
Compound S	tons	0.25	0.20	0.20	0.20	0.20
	price	2,220.00	2,220.00	2,220.00	2,220.00	2,220.00
Fertilizer Application	cost/ha	40.50	40.50	40.50	40.50	40.50
Lasochor	liters	3.50	3.50	3.50	3.50	3.50
	price	48.50	48.50	48.50	48.50	48.50
Ingran	liters	2.20	2.20	2.20	2.20	2.20
	price	106.36	106.36	106.36	106.36	106.36
Endosulfan 35MO	liters	1.00	1.00	1.00	1.00	1.00
	price	137.00	137.00	137.00	137.00	137.00
Harvest labor	lds/t	0.55	0.55	0.55	0.55	0.55
	price	14.21	14.21	14.21	14.21	14.21
Tractor plus equipment	ld/t	0.90	0.90	0.90	0.90	0.90
minus harvest	price/ld	14.21	14.21	14.21	14.21	14.21
Contract combine	cost	410.00	410.00	410.00	410.00	410.00
Artificial drying(coal)	kgs/t	12.00	12.00	12.00	12.00	12.00
	price/kg	0.34	0.34	0.34	0.34	0.34
Electricity	Kwh/t	3.00	3.00	3.00	3.00	3.00
	price/kwh	5.11	5.11	5.11	5.11	5.11
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	742.00	742.00	742.00	742.00	742.00

Winter Irrigated Wheat

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	4.10	4.90	5.20	4.10	5.10
Inputs and ex-Harare Prices(Z$)						
Pre harvesting labor	lds	16.62	16.62	16.62	16.62	16.62
	Price	14.21	14.21	14.21	14.21	14.21
Tractor and equipment	lts	74.90	74.90	74.90	74.90	74.90
	price	2.63	2.63	2.63	2.63	2.63
Seed	kgs	100.00	100.00	100.00	100.00	100.00
	price	3.58	3.58	3.58	3.58	3.58
Compound D	tons	0.45	0.45	0.00	0.45	0.00
	price	1,604.00	1,604.00	1,604.00	1,604.00	1,604.00
Ammonium Nitrate	Tons	0.35	0.35	0.40	0.35	0.40
	Price	1,970.00	1,970.00	1,970.00	1,970.00	1,970.00
LIME	Tons	0.40	0.40	0.40	0.40	0.40
	Price	360.00	360.00	360.00	360.00	360.00
Compound S	tons	0.00	0.00	0.50	0.00	0.50
	price	2,220.00	2,220.00	2,220.00	2,220.00	2,220.00
MCPA	liters	1.00	1.00	1.00	1.00	1.00
	price	45.00	45.00	45.00	45.00	45.00
Buctril	liters	2.00	2.00	2.00	2.00	2.00
	price	84.83	84.83	84.83	84.83	84.83
Monocrotophos	liters	0.50	0.50	0.50	0.50	0.50
	price	85.00	85.00	85.00	85.00	85.00
Irrigation	Cub. m	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00
	price	0.30	0.30	0.30	0.30	0.30
Harvest labor	lds/t	0.50	0.50	0.50	0.50	0.50
	price	14.21	14.21	14.21	14.21	14.21
Tractor plus equipment	ld/t	1.30	1.30	1.30	1.30	1.30
minus harvest	price/ld	14.21	14.21	14.21	14.21	14.21
Contract combine	cost	410.00	410.00	410.00	410.00	410.00
Artificial drying(coal)	kgs/t	8.00	8.00	8.00	8.00	8.00
	price/kg	0.34	0.34	0.34	0.34	0.34
Electricity	Kwh/t	0.30	0.30	0.30	0.30	0.30
	price/kwh	5.11	5.11	5.11	5.11	5.11
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land cost	$/ha	742.00	742.00	212.50	26.50	26.50

Appendix 3

Small Scale Commercial Sector Crop Budgets

Cotton 1

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	0.80	0.86	0.82	0.65
Inputs and ex-Harare Prices (Z$)					
Seed (K502)	kgs	20.00	20.00	20.00	20.00
	price	7.00	7.00	7.00	7.00
Compound L	kgs	100.00	100.00	100.00	100.00
	price	1.99	1.99	1.99	1.99
Ammonium Nitrate	kgs	75.00	75.00	75.00	75.00
	Price	1.97	1.97	1.97	1.97
Carbaryl	lts	1.00	1.00	1.00	1.00
	Price	88.00	88.00	88.00	88.00
Dimethoate	lts	1.00	1.00	1.00	1.00
	price	58.00	58.00	58.00	58.00
Molassis	lts	10.00	10.00	10.00	10.00
	Price	0.90	0.90	0.90	0.90
Pre-harvest Labor	hrs/ha	404.00	404.00	404.00	404.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	1.70	1.70	1.70	1.70
Packaging	bags/t	5.00	5.00	5.00	5.00
	price/bag	53.96	53.96	53.96	53.96
Twine	kgs/t	0.13	0.13	0.13	0.13
	price/kg	24.75	24.75	24.75	24.75
Land Cost	$/ha	159.00	79.50	26.50	26.50

Cotton 2

Agroecological Zone		**2**	**3**	**4**	**5**
Yield:	t/ha	2.00	1.90	1.56	1.50
Inputs for highest area yields					
Seed(K502)	kgs	20.00	20.00	20.00	20.00
	price	7.00	7.00	7.00	7.00
Compound L	kgs	150.00	150.00	150.00	150.00
	price	1.99	1.99	1.99	1.99
Ammonium nitrate	kgs	100.00	100.00	100.00	100.00
	price	1.97	1.97	1.97	1.97
Carbaryl	lts	2.00	2.00	2.00	2.00
	Price	88.00	88.00	88.00	88.00
Dimethoate	lts	1.00	1.00	1.00	1.00
	price	58.00	58.00	58.00	58.00
Molassis	lts	10.00	10.00	10.00	10.00
	price	0.90	0.90	0.90	0.90
Endosulfan	lts	2.00	2.00	2.00	2.00
	price	137.00	137.00	137.00	137.00
Pre-harvest Labor	hrs/ha	404.00	404.00	404.00	404.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	1.70	1.70	1.70	1.70
Packaging	bags/t	5.00	5.00	5.00	5.00
	price/bag	53.96	53.96	53.96	53.96
Twine	kgs/t	0.13	0.13	0.13	0.13
	price/kg	24.75	24.75	24.75	24.75
Land cost	$/ha	159.00	79.50	26.50	26.50

Groundnut 1

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yields	t/ha	0.80	0.85	0.85	0.70	0.52
Inputs and ex-Harare Price(Z$)						
Retained seed	kgs	60.00	60.00	60.00	60.00	60.00
	price	3.40	3.40	3.40	3.40	3.40
Pre-harvest Labor	hrs/ha	300.00	300.00	300.00	300.00	300.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.85	0.85	0.85	0.85	0.85
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land cost	$/ha	159.00	159.00	79.50	26.50	26.50

Groundnut 2

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yields	t/ha	2.50	2.50	1.90	1.35	1.20
Inputs and ex-Harare Price (Z$)						
Seed (Falcon Vareity)	kgs	90.00	90.00	90.00	90.00	90.00
	price	8.00	8.00	8.00	8.00	8.00
Single Super Phosphate	kgs	200.00	200.00	200.00	200.00	200.00
	price	1.20	8.00	8.00	8.00	8.00
Gypsum	kgs	200.00	200.00	200.00	200.00	200.00
	price	0.36	0.36	0.36	0.36	0.36
Dimethoate 40	liters	1.00	1.00	1.00	1.00	1.00
	price	58.00	58.00	58.00	58.00	58.00
Pre-harvest Labor	hrs/ha	300.00	300.00	300.00	300.00	300.00
	price	0.98	0.98	0.98	0.98	0.98
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land cost	$/ha	159.00	159.00	79.50	26.50	26.50

Maize 1

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield		2.50	2.39	1.69	0.95	0.70
Inputs and ex-Harare Prices (Z$)						
Seed (R215)	kgs	20.00	20.00	20.00	20.00	20.00
	price	4.96	4.96	4.96	4.96	4.96
Compound D	kgs	150.00	150.00	150.00	150.00	150.00
	price	1.60	1.60	1.60	1.60	1.60
Ammonium nitrate	kgs	120.00	120.00	120.00	120.00	120.00
	price	1.97	1.97	1.97	1.97	1.97
Pre-harvest Labor	hrs/ha	380.00	380.00	380.00	380.00	380.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.32	0.32	0.32	0.32	0.32
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	159.00	159.00	79.50	26.50	26.50

Maize 2

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield		5.00	4.80	3.32	1.81	1.50
Inputs and ex-Harare Prices(Z$)						
Seed (SC625)	kgs	20.00	20.00	20.00	20.00	20.00
	price	4.96	4.96	4.96	4.96	4.96
Compound D	kgs	350.00	350.00	350.00	350.00	350.00
	price	1.60	1.60	1.60	1.60	1.60
Ammonium Nitrate	kgs	250.00	250.00	250.00	250.00	250.00
	Price	1.97	1.97	1.97	1.97	1.97
Dipterex	kgs	4.00	4.00	4.00	4.00	4.00
	Price	10.44	10.44	10.44	10.44	10.44
Pre-harvest Labor	hrs/ha	380.00	380.00	380.00	380.00	380.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.32	0.32	0.32	0.32	0.32
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	159.00	159.00	79.50	26.50	26.50

Sorghum 1

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	1.00	0.74	0.75	0.75	0.75
Inputs and ex-Harare Prices (Z$)						
Retained Seed	kgs	20.00	20.00	20.00	20.00	20.00
	price	0.92	0.92	0.92	0.92	0.92
Compound D	kgs	50.00	50.00	50.00	50.00	50.00
	price	1.60	1.60	1.60	1.60	1.60
Ammonium Nitrate	kgs	50.00	50.00	50.00	50.00	50.00
	price	1.97	1.97	1.97	1.97	1.97
Pre-harvest Labor	hrs/ha	250.00	250.00	250.00	250.00	250.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.50	0.50	0.50	0.50	0.50
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	26.50	159.00	159.00	159.00	159.00

Sorghum 2

Agroecological Zone		**1**	**2**	**3**	**4**	**5**
Yield	t/ha	4.00	2.93	1.83	1.61	1.20
Inputs and ex-Harare Prices(Z$)						
Seed(DC75)	kgs	12.00	12.00	12.00	12.00	12.00
	price	6.00	6.00	6.00	6.00	6.00
Compound D	kgs	200.00	200.00	200.00	200.00	200.00
	price	1.60	1.60	1.60	1.60	1.60
Ammonium Nitrate	kgs	150.00	150.00	150.00	150.00	150.00
	Price	1.97	1.97	1.97	1.97	1.97
dipterex	lts	4.00	4.00	4.00	4.00	4.00
	Price	10.44	10.44	10.44	10.44	10.44
Dimethoate	lts	1.00	1.00	1.00	1.00	1.00
	price	58.00	58.00	58.00	58.00	58.00
Pre-harvest Labor	hrs/ha	250.00	250.00	250.00	250.00	250.00
	price	0.98	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.50	0.50	0.50	0.50	0.50
Packaging	bags/t	20.00	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75	24.75
Land Cost	$/ha	26.50	159.00	159.00	159.00	159.00

Sunflower 1

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	0.80	0.77	0.62	0.60
Inputs and ex-Harare Prices (Z$)					
Retained Seed	kgs	20.00	20.00	20.00	20.00
	price	1.60	1.60	1.60	1.60
Ammonium nitrate	kgs	50.00	50.00	50.00	50.00
	price	1.97	1.97	1.97	1.97
Pre-harvest Labor	hrs/ha	150.00	150.00	150.00	150.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.56	0.56	0.56	0.56
Packaging	bags/t	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land cost	$/ha	159.00	79.50	26.50	26.50

Sunflower 2

Agroecological Zone		**2**	**3**	**4**	**5**
Yield	t/ha	2.50	1.55	1.32	1.20
Inputs and ex-Harare Prices (Z$)					
Seed (G101)	kgs	10.00	10.00	10.00	10.00
	price	15.00	15.00	15.00	15.00
Compound L	kgs	200.00	200.00	200.00	200.00
	price	1.99	1.99	1.99	1.99
Ammonium nitrate	kgs	100.00	100.00	100.00	100.00
	Price	1.97	1.97	1.97	1.97
Pre-harvest Labor	hrs/ha	150.00	150.00	150.00	150.00
	price	0.98	0.98	0.98	0.98
Harvest labor	hrs/kg	0.56	0.56	0.56	0.56
Packaging	bags/t	20.00	20.00	20.00	20.00
	price/bag	5.50	5.50	5.50	5.50
Twine	kgs/t	0.09	0.09	0.09	0.09
	price/kg	24.75	24.75	24.75	24.75
Land cost	$/ha	159.00	79.50	26.50	26.50

Appendix 4

Input Import Content and Conversion Factors

Input	Import Content	Conversion Factor
Sorghum - SV2 variety	20	0.94
Ground nut seed	20	0.94
Soybean seed	20	0.94
Cotton seed	20	0.94
Maize long season	20	0.94
Sorghum seed - DC75	20	0.94
Maize seed short season	20	0.94
Average seed	20	0.94
Average seed dressing	50.5	0.85
Double super P	17	0.95
Triple super P	15	0.96
Single Super P	18	0.95
Compound D	38	0.89
Lime	20	0.94
Ammonium nitrate	52	0.84
Compound L	45	0.87
Compound M	40	0.88
Average fertiliser	30.63	0.91
Thiodan granulated	56	0.832
Carbaryl 85%	51	0.847
Endosulfan	98	0.71
Metasystox	40	0.88
Thiodan MO35	98	0.71
Malathion	40	0.88
Dimethoate 40	40	0.88
Agrithrin	46	0.86
Ripcod	97	0.709
Karate	56	0.83
Tedion	40	0.88
Monocrotophos	44	0.87
Dipterex 2.5%	40	0.88
Stalkborer	52	0.84
Dursban	44	0.87
Dipterex SP95	45	0.87
Avg insecticide	55.44	0.83
Trifluralin	90	0.73
Atrazine 50FW	40	0.88
Dual 720 EC	44	0.87
Cotoran 80 wb	42	0.87
gramoxone	66	0.80
Basagram	40	0.88
Bladex	98	0.71

Average herbicide	60	0.82
Fungicide(benomyl)	54	0.84
Packing material (cotton)	20	0.94
Packing material(maize)	40	0.88
Average packaging	30	0.91
Transport	30	0.91
Fuel and Lubricants		
Diesel	90	0.73
Delvac 1330	90	0.73
Super XHP	90	0.73
Mobilube 80W-90	90	0.73
Mobil MP grease	90	0.73
Average Fuels and Lubes	90	0.73

Appendix 5

Distances from Farm to Harare/Mutare and Transport Costs

District	Area (Sq. KM)	Distance: Farm to District Center	Distance to Mutare	Distance to Harare	Transport cost per kg or litre(Z$)
Buhera	5,354.02	21	132	282	0.29
Chimanimani	3,211.71	16	150	413	0.41
Chipinge	4,927.75	20	186	449	0.45
Makoni	7,891.57	25	93	170	0.19
Mutare	5,542.11	21	0	263	0.27
Mutasa	2,558.93	14	51	304	0.30
Nyanga	5,497.23	21	105	268	0.27
Bindura	2,279.75	13	353	88	0.15
Muzarabani	3,803.54	17	542	274	0.28
Guruve	7,787.51	25	443	140	0.19
Mazowe	4,477.35	19	385	122	0.15
Mount Darwin	4,580.83	19	422	150	0.19
Rushinga	2,408.66	14	482	216	0.22
Shamva	2,753.65	15	378	115	0.15
Chikomba	6,630.36	23	241	173	0.19
Goromonzi	2,487.21	14	253	37	0.08
Wedza	2,584.91	14	124	145	0.19
Marondera	3,534.35	17	191	74	0.11
Mudzi	4,004.94	18	458	193	0.20
Murehwa	3,494.06	17	352	87	0.15
Mutoko	4,050.31	18	408	143	0.19
Seke	2,570.32	14	297	34	0.07
Murehwa-UMP	2,678.64	15	415	150	0.19
Chegutu	5,363.65	21	370	107	0.15
Hurungwe	19,825.81	40	473	218	0.25
Kadoma	9,144.55	27	404	141	0.19
Kariba	6,282.48	22	629	366	0.37
Makonde	8,742.99	26	379	116	0.15
Zvimba	6,101.97	22	345	95	0.15
Binga	10,682.88	29	1,114	851	0.84
Bubi	5,547.36	21	504	499	0.49
Hwange	29,360.83	48	916	778	0.79
Lupane	7,772.32	25	741	603	0.60
Nkayi	5,328.09	21	581	316	0.32
Tsholotsho	7,808.06	25	680	541	0.54
Umguza	6,114.00	22	615	477	0.47
Beitbridge	12,708.64	32	585	580	0.58
Bulilimamangwe	12,382.59	31	681	541	0.54
Gwanda	10,538.41	29	570	565	0.57

District	Area (Sq. KM)	Distance: Farm to District Center	Distance to Mutare	Distance to Harare	Transport cost per kg or litre(Z$)
Insiza	8,089.78	25	517	512	0.51
Matobo	6,584.98	23	627	489	0.49
Umzingwane	2,704.14	15	621	483	0.47
Chirimhanzu	4,733.52	19	393	196	0.20
Gokwe	17,619.62	37	616	351	0.37
Gweru	6,284.99	22	480	275	0.28
Kwekwe	8,564.64	26	478	213	0.23
Mberengwa	4,999.10	20	429	424	0.42
Shurugwi	3,628.02	17	517	312	0.31
Zvishavane	2,580.96	14	394	389	0.38
Gokwe South.	17,619.62	37	616	351	0.37
Bikita	5,191.88	20	231	392	0.39
Chiredzi	17,295.01	37	319	495	0.51
Chivi	3,569.84	17	348	343	0.34
Gutu	7,128.61	24	315	216	0.23
Masvingo	6,718.49	23	297	292	0.30
Mwenezi	12,890.64	32	480	275	0.29
Zaka	3,113.05	16	269	480	0.47

Appendix 6

Communal Policy Analysis Matrices

Burley 1(average farmer practices)

PAM-NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	17,150.55	789.72	4,464.46	11,896.37
Social	19,455.27	893.96	4,364.76	14,196.55
Policy Effects	-2,304.72	-104.24	99.70	-2,300.18

PAM-NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	10,608.91	750.01	3,757.29	6,101.61
Social	12,034.51	849.01	3,591.19	7,594.32
Policy Effects	-1,425.60	-99.00	166.11	-1,492.71

Burley 2 (best farmer practices)

PAM-NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	26,521.47	1,047.22	16,939.95	8,534.30
Social	30,085.47	1,185.45	24,481.13	4,418.89
Policy Effects	-3,564.00	-138.23	-7,541.18	4,115.41

PAM-NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	17,681.52	1,047.22	15,777.65	856.65
Social	20,057.52	1,185.45	23,832.83	-4,960.76
Policy Effects	-2,376.00	-138.23	-8,055.18	5,817.41

Cotton 1(average farmer practices)

PAM-NR 2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	5,287.15	316.55	3,145.32	1,825.28
Social	6,455.00	358.33	3,193.26	2,903.41
Policy Effects	-1,167.86	-41.78	-47.94	-1,078.13

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	4,142.51	300.90	2,688.65	1,152.95
Social	5,057.53	340.62	2,662.25	2,054.66
Policy Effects	-915.02	-39.72	26.40	-901.70

Cotton 1 (average farmer practices), continued

PAM NR4

	Tradables		**Domestic**	**Profits**
	Output	**Inputs**	**Resources**	
Private	3,270.40	288.98	2,340.71	640.71
Social	3,992.79	327.13	2,265.24	1,400.41
Policy Effects	-722.39	-38.15	75.47	-759.71

PAM NR5

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	2,997.87	285.26	2,231.98	480.63
Social	3,660.05	322.91	2,157.74	1,179.40
Policy Effects	-662.19	-37.65	74.24	-698.77

Cotton 2 (best farmer practices)

PAM-NR 2

	Tradables		**Domestic**	**Profits**
	Output	**Inputs**	**Resources**	
Private	8,176.00	635.69	4,664.72	2,875.59
Social	9,981.97	719.60	4,591.01	4,671.35
Policy Effects	-1,805.96	-83.91	73.71	-1,795.76

PAM NR3

	Tradables		**Domestic**	**Profits**
	Output	**Inputs**	**Resources**	
Private	6,213.76	608.87	3,881.86	1,723.03
Social	7,586.29	689.24	3,737.49	3,159.56
Policy Effects	-1,372.53	-80.37	144.37	-1,436.53

PAM NR4

	Tradables		**Domestic**	**Profits**
	Output	**Inputs**	**Resources**	
Private	5,450.67	598.44	3,577.41	1,274.81
Social	6,654.64	677.43	3,383.49	2,593.72
Policy Effects	-1,203.98	-78.99	193.93	-1,318.91

PAM NR5

	Tradables		**Domestic**	**Profits**
	Output	**Inputs**	**Resources**	
Private	5,450.67	598.44	3,577.41	1,274.81
Social	6,654.64	677.43	3,383.49	2,593.72
Policy Effects	-1,203.98	-78.99	193.93	-1,318.91

Finger Millet 1 (average farmer practices)

PAM-NR 2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,930.70	31.19	834.79	1,064.72
Social	2,215.82	35.31	983.74	1,196.77
Policy Effects	-285.12	-4.12	-148.95	-132.05

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,662.54	28.13	756.64	877.78
Social	1,908.06	31.84	827.10	1,049.13
Policy Effects	-245.52	-3.71	-70.46	-171.35

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,635.73	27.82	748.82	859.08
Social	1,877.29	31.49	766.38	1,079.41
Policy Effects	-241.56	-3.67	-17.56	-220.33

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,608.91	27.52	741.01	840.39
Social	1,846.51	31.15	758.67	1,056.70
Policy Effects	-237.60	-3.63	-17.66	-216.31

Finger millet 2 (best farmer practices)

PAM-NR 2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	4,022.29	158.96	1,662.26	2,201.06
Social	4,616.29	179.94	1,765.35	2,670.99
Policy Effects	-594.00	-20.98	-103.09	-469.93

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	3,217.83	149.78	1,427.81	1,640.24
Social	3,693.03	169.55	1,454.43	2,069.06
Policy Effects	-475.20	-19.77	-26.62	-428.81

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,681.52	143.66	1,271.51	1,266.36
Social	3,077.52	162.62	1,247.14	1,667.76
Policy Effects	-396.00	-18.96	24.37	-401.40

Finger millet 2 (best farmer practices), continued

PAM NR5

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	2,681.52	143.66	1,271.51	1,266.36
Social	3,077.52	162.62	1,247.14	1,667.76
Policy Effects	-396.00	-18.96	24.37	-401.40

Groundnut 1 (average farmer practices)

PAM-NR 2

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	2,680.53	54.05	1,315.02	1,311.47
Social	7,442.82	56.60	1,462.19	5,924.03
Policy Effects	-4,762.28	-2.55	-147.17	-4,612.57

PAM NR3

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	2,714.04	54.39	1,325.64	1,334.01
Social	7,535.85	56.95	1,393.24	6,085.67
Policy Effects	-4,821.81	-2.56	-67.60	-4,751.65

PAM NR4

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	2,010.40	47.32	1,102.48	860.60
Social	5,582.11	49.67	1,118.56	4,413.88
Policy Effects	-3,571.71	-2.35	-16.08	-3,553.28

PAM NR5

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	670.13	33.87	677.40	-41.14
Social	1,860.70	35.81	696.31	1,128.58
Policy Effects	-1,190.57	-1.94	-18.91	-1,169.72

Groundnut 2 (best farmer practices)

PAM-NR 2

	Tradables		Domestic	Profits
	Output	Inputs	Resources	
Private	5,026.00	339.11	3,188.69	1,498.20
Social	13,955.29	358.12	3,274.40	10,322.76
Policy Effects	-8,929.28	-19.01	-85.71	-8,824.57

Groundnut 2 (best farmer practices), continued

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	4,355.87	332.39	2,976.15	1,047.33
Social	1,294.58	351.19	2,983.78	8,759.61
Policy Effects	-7,738.71	-18.81	-7.62	-7,712.28

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	3,350.67	322.30	2,657.35	371.02
Social	9,303.52	340.80	2,614.09	6,348.63
Policy Effects	-5,952.86	-18.50	43.26	-5,977.61

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,010.40	308.85	2,232.27	-530.72
Social	5,582.11	326.94	2,191.84	3,063.33
Policy Effects	-3,571.71	-18.10	40.44	-3,594.05

Maize 1 (average farmer practices)

PAM-NR 1

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,035.60	1,47.54	1,119.83	-231.77
Social	1,017.44	95.19	1,248.35	-326.10
Policy Effects	18.17	52.35	-128.52	94.33

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,796.12	325.35	2,052.84	417.93
Social	2,747.08	218.76	2,145.54	382.78
Policy Effects	49.05	106.59	-92.70	35.15

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,151.75	271.34	1,719.04	161.37
Social	2,114.00	164.08	1,743.12	206.81
Policy Effects	37.74	107.26	-24.08	-45.44

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,150.67	150.91	1,165.85	-166.09
Social	1,130.48	98.65	1,161.16	-129.33
Policy Effects	20.18	52.25	4.69	-36.76

Maize 1 (average farmer practices), continued

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	494.79	40.56	750.72	-296.49
Social	486.11	43.63	768.14	-325.66
Policy Effects	8.68	-3.06	-17.43	29.17

Maize 2 (best farmer practices)

PAM-NR 1

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,876.67	474.32	2,349.76	52.60
Social	2,826.21	471.22	2,419.62	-64.63
Policy Effects	50.46	3.10	-69.87	117.23

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	3,889.26	503.91	2,754.72	630.63
Social	3,821.04	501.71	2,818.37	500.96
Policy Effects	68.22	2.20	-63.65	129.67

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,876.67	474.32	2,349.76	52.60
Social	2,826.21	471.22	2,340.12	14.87
Policy Effects	50.46	3.10	9.63	37.73

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,772.03	442.03	1,907.98	-577.98
Social	1,740.95	437.96	1,852.12	-549.14
Policy Effects	31.08	4.07	55.85	-28.84

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,058.61	421.18	1,622.66	-985.23
Social	1,040.05	416.48	1,571.19	-947.63
Policy Effects	18.57	4.70	51.47	-37.60

Pearl millet 1 (average farmer practices)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	432.83	20.16	800.95	-388.28
Social	390.91	20.88	955.73	-585.70
Policy Effects	41.92	-0.72	-154.78	197.42

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	432.83	20.16	800.95	-388.28
Social	390.91	20.88	876.23	-506.20
Policy Effects	41.92	-0.72	-75.28	117.92

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	554.03	24.87	925.86	-396.69
Social	500.37	25.73	947.15	-472.51
Policy Effects	53.66	-0.86	-21.29	75.81

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	259.70	13.43	622.52	-376.25
Social	234.55	13.95	646.21	-425.61
Policy Effects	25.15	-0.52	-23.69	49.36

Pearl millet 2 (best farmer practice)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	865.67	226.84	1,593.32	-954.49
Social	781.83	224.65	1,709.98	-1,152.80
Policy Effects	83.84	2.19	-116.66	198.31

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	865.67	226.84	1,593.32	-954.49
Social	781.83	224.65	1,630.48	-1,073.30
Policy Effects	83.84	2.19	-37.16	118.81

Pearl millet (best farmer practices), continued

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	865.67	226.84	1,593.32	-954.49
Social	781.83	224.65	1,577.48	-1,020.30
Policy Effects	83.84	2.19	15.84	65.81

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	865.67	226.84	1,593.32	-954.49
Social	781.83	224.65	1,577.48	-1,020.30
Policy Effects	83.84	2.19	15.84	65.81

Sorghum 1 (average farmer practices)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,013.00	28.57	796.63	187.80
Social	420.82	29.54	949.65	-558.37
Policy Effects	592.18	-0.97	-153.02	746.17

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	877.93	25.20	730.15	122.58
Social	364.71	26.08	804.38	-465.74
Policy Effects	513.23	-0.87	-74.22	588.32

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	972.48	27.56	776.69	168.23
Social	403.98	28.50	797.42	-421.93
Policy Effects	568.50	-0.94	-20.73	590.17

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	715.85	21.17	650.38	44.31
Social	297.38	21.92	672.45	-396.99
Policy Effects	418.48	-0.75	-22.07	441.30

Sorghum 2 (best farmer practices)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,363.67	311.10	1,932.52	120.05
Social	981.90	308.79	2,033.32	-1,360.20
Policy Effects	1,381.76	2.31	-100.80	1,480.25

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,363.67	311.10	1,932.52	120.05
Social	981.90	308.79	1,953.82	-1,280.70
Policy Effects	1,381.76	2.31	-21.30	1,400.75

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,350.67	285.88	1,433.91	-369.12
Social	561.09	282.80	1,407.51	-1,129.23
Policy Effects	789.58	3.07	26.40	760.10

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,350.67	285.88	1,433.91	-369.12
Social	561.09	282.80	1,407.51	-1,129.23
Policy Effects	789.58	3.07	26.40	760.10

Sunflower 1 (Average farmer practices)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,445.57	36.61	828.75	580.21
Social	2,510.05	37.98	980.00	1,492.07
Policy Effects	-1,064.49	-1.37	-151.24	-911.87

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,377.54	35.26	799.43	542.85
Social	2,391.93	36.60	871.46	1,483.88
Policy Effects	-1,014.39	-1.33	-72.03	-941.03

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	986.39	27.53	630.84	328.02
Social	1,712.74	28.63	651.49	1,032.62
Policy Effects	-726.36	-1.10	-20.65	-704.60

Sunflower (average farmer practices), continued

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,037.41	28.53	652.83	356.04
Social	1,801.33	29.67	673.27	1,098.40
Policy Effects	-763.93	-1.13	-20.44	-742.35

Sunflower 2 (best farmer practices)

PAM NR2

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,551.00	315.55	1,696.07	539.38
Social	4,429.51	309.27	1,798.60	2,321.64
Policy Effects	-1,878.50	6.28	-102.53	-1,782.26

PAM NR3

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	2,210.87	308.83	1,549.47	352.57
Social	3,838.91	302.34	1,573.91	1,962.66
Policy Effects	-1,628.04	6.49	-24.44	-1,610.09

PAM NR4

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,700.67	298.74	1,329.56	72.37
Social	2,953.00	2,91.95	1,303.12	1,357.94
Policy Effects	-1,252.34	6.79	26.44	-1,285.57

PAM NR5

	Tradables		Domestic	Profits
	Output	**Inputs**	**Resources**	
Private	1,700.67	298.74	1,329.56	72.37
Social	2,953.00	291.95	1,303.12	1,357.94
Policy Effects	-1,252.34	6.79	26.44	-1,285.57

Appendix 7

Large Scale Commercial Policy Analysis Matrices

Barley

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	35,363.05	3,390.51	16,270.62	15,701.91
Social	40,115.05	3,320.92	14,838.57	21,955.56
Policy Effects	-4,752.00	69.60	1,432.05	-6,253.65

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	23,870.06	3,314.07	14,042.09	6,513.90
Social	27,077.66	3,242.17	12,626.08	11,209.40
Policy Effects	-3,207.60	71.90	1,416.00	-4,695.50

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	19,980.12	3,288.20	12,757.81	3,934.11
Social	22,665.00	3,215.52	11,347.24	8,102.24
Policy Effects	-2,684.88	72.68	1,410.57	-4,168.13

Burley Tobacco

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	35,363.05	3,390.51	16,270.62	15,701.91
Social	40,115.05	3,320.92	14,838.57	21,955.56
Policy Effects	-4,752.00	69.60	1,432.05	-6,253.65

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	23,870.06	3,314.07	14,042.09	6,513.90
Social	27,077.66	3,242.17	12,626.08	11,209.40
Policy Effects	-3,207.60	71.90	1,416.00	-4,695.50

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	19,980.12	3,288.20	12,757.81	3,934.11
Social	22,665.00	3,215.52	11,347.24	8,102.24
Policy Effects	-2,684.88	72.68	1,410.57	-4,168.13

Cotton

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	8,176.00	1,921.46	4,653.78	1,600.76
Social	9,981.97	1,802.31	4,226.79	3,952.87
Policy Effects	-1,805.96	119.15	427.00	-2,352.11

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	7,630.93	1,807.52	4,427.53	1,395.89
Social	9,316.50	1,691.66	4,021.07	3,603.77
Policy Effects	-1,685.57	115.86	406.46	-2,207.89

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,995.73	1,782.36	3,701.97	511.40
Social	7,320.11	1,665.79	3,303.10	2,351.22
Policy Effects	-1,324.37	116.58	398.87	-1,839.82

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,905.60	1,765.59	3,386.10	-246.09
Social	5,989.18	1,648.54	2,992.29	1,348.35
Policy Effects	-1,083.58	117.06	393.81	-1,594.45

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,905.60	1,765.59	3,386.10	-246.09
Social	5,989.18	1,648.54	2,992.29	1,348.35
Policy Effects	-1,083.58	117.06	393.81	-1,594.45

Groundnuts

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	6,410.39	1,251.50	3,951.18	1,207.72
Social	13,211.00	1,230.97	3,576.54	8,403.50
Policy Effects	-6,800.61	20.53	374.64	-7,195.78

Groundnuts, continued

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	10,563.61	1,411.24	4,366.24	4,786.13
Social	21,770.25	1,386.77	3,925.35	16,458.13
Policy Effects	-11,206.64	24.46	440.89	-11,672.00

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,965.80	1,195.93	3,276.81	493.06
Social	10,233.88	1,176.78	2,925.21	6,131.89
Policy Effects	-5,268.08	19.16	351.60	-5,638.83

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,889.19	1,116.06	2,883.78	-1,110.65
Social	5,954.26	1,098.87	2,565.31	2,290.07
Policy Effects	-3,065.06	17.19	318.47	-3,400.72

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,670.31	1,069.18	2,761.96	-2,160.84
Social	3,442.30	1,053.15	2,462.94	-73.78
Policy Effects	-1,771.99	16.03	299.03	-2,087.05

Maize

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,638.27	1,360.42	3,503.39	774.47
Social	5,539.37	1,341.89	3,217.11	980.37
Policy Effects	98.90	18.53	286.28	-205.91

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,178.00	1,343.50	3,459.70	374.80
Social	5,087.18	1,324.70	3,176.90	585.58
Policy Effects	90.83	18.80	282.80	-210.77

Maize, continued

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,452.00	1,093.94	2,452.98	-94.92
Social	3,391.45	1,078.90	2,216.00	96.55
Policy Effects	60.55	15.04	236.98	-191.46

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,956.14	1,038.97	2,125.49	-1,208.33
Social	1,921.82	1,023.04	1,899.83	-1,001.04
Policy Effects	34.31	15.93	225.67	-207.28

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,956.14	1,038.97	2,125.49	-1,208.33
Social	1,921.82	1,023.04	1,899.83	-1,001.04
Policy Effects	34.31	15.93	225.67	-207.28

Paprika

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	11,492.99	3,617.61	13,762.65	-5,887.26
Social	13,037.39	3,476.99	11,224.93	-1,664.53
Policy Effects	-1,544.40	140.61	2,537.72	-4,222.73

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	31,826.74	3,617.61	13,762.65	14,446.49
Social	36,103.54	3,476.99	11,224.93	21,401.62
Policy Effects	-4,276.80	140.61	2,537.72	-6,955.13

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	17,681.52	3,617.61	13,232.65	831.27
Social	20,057.52	3,476.99	10,694.93	5,885.60
Policy Effects	-2,376.00	140.61	2,537.72	-5,054.33

Paprika, continued

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	17,681.52	3,617.61	13,047.15	1,016.77
Social	20,057.52	3,476.99	10,509.43	6,071.10
Policy Effects	-2,376.00	140.61	2,537.72	-5,054.33

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	17,681.52	3,617.61	13,047.15	1,016.77
Social	20,057.52	3,476.99	10,509.43	6,071.10
Policy Effects	-2,376.00	140.61	2,537.72	-5,054.33

Sorghum

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	6,753.34	1,296.09	3,396.37	2,060.87
Social	2,805.44	1,277.62	3,124.05	-1,596.23
Policy Effects	3,947.90	18.47	272.33	3,657.10

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,402.67	1,195.92	3,197.55	1,009.21
Social	2,244.35	1,179.26	2,943.38	-1,878.29
Policy Effects	3,158.32	16.66	254.17	2,887.50

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,241.10	1,064.58	2,405.61	770.91
Social	1,761.82	1,049.74	2,175.65	-1,463.57
Policy Effects	2,479.28	14.84	229.96	2,234.48

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,241.60	1,033.29	2,132.43	75.88
Social	1,346.61	1,017.94	1,908.91	-1,580.24
Policy Effects	1,894.99	15.35	223.52	1,656.12

Sorghum, continued
PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,701.34	1,016.38	2,085.04	-400.08
Social	1,122.18	1,000.75	1,865.00	-1,743.58
Policy Effects	1,579.16	15.63	220.03	1,343.50

Soyabeans
PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,752.42	1,324.68	3,423.69	1,004.05
Social	7,254.36	1,298.95	3,167.84	2,787.58
Policy Effects	-1,501.94	25.74	255.85	-1,783.53

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,888.96	1,254.41	3,214.53	-579.97
Social	4,904.36	1,226.71	2,974.29	703.36
Policy Effects	-1,015.40	27.69	240.24	-1,283.33

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,564.88	1,249.00	2,666.94	-351.06
Social	4,495.66	1,221.17	2,428.05	846.44
Policy Effects	-930.78	27.83	238.90	-1,197.51

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,160.53	1,225.57	2,405.24	-1,470.27
Social	2,724.64	1,197.16	2,172.16	-644.67
Policy Effects	-564.11	28.41	233.08	-825.61

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,160.53	1,225.57	2,405.24	-1,470.27
Social	2,724.64	1,197.16	2,172.16	-644.67
Policy Effects	-564.11	28.41	233.08	-825.61

Sunflower

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,851.00	777.35	2,304.18	-230.52
Social	4,429.51	751.94	2,121.74	1,555.83
Policy Effects	-1,578.50	25.41	182.43	-1,786.35

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,523.59	869.17	2,542.09	1,112.33
Social	7,028.15	843.15	2,329.21	3,855.79
Policy Effects	-2,504.56	26.03	212.88	-2,743.46

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,896.37	853.32	1,954.50	1,088.55
Social	6,053.66	827.14	1,749.70	3,476.82
Policy Effects	-2,157.29	26.18	204.79	-2,388.26

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,117.10	784.07	1,613.11	719.91
Social	4,842.93	758.73	1,427.25	2,656.95
Policy Effects	-1,725.83	25.34	185.86	-1,937.04

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,117.10	784.07	1,613.11	719.91
Social	4,842.93	758.73	1,427.25	2,656.95
Policy Effects	-1,725.83	25.34	185.86	-1,937.04

Virginia Tobacco

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	31,345.54	3,464.39	22,803.93	5,077.21
Social	35,536.54	3,414.94	18,781.81	13,339.78
Policy Effects	-4,191.00	49.45	4,022.12	-8,262.57

Virginia Tobacco, continued

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	48,128.97	3,492.00	26,112.22	18,524.75
Social	54,563.97	3,443.38	21,340.56	29,780.03
Policy Effects	-6,435.00	48.62	4,771.67	-11,255.28

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	38,009.55	3,475.36	23,587.52	10,946.67
Social	43,091.55	3,426.23	19,267.78	20,397.53
Policy Effects	-5,082.00	49.12	4,319.73	-9,450.85

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	30,851.90	3,463.58	21,991.13	5,397.20
Social	34,976.90	3,414.11	17,991.05	13,571.74
Policy Effects	-4,125.00	49.48	4,000.07	-8,174.55

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	11,106.69	3,431.10	18,099.02	-10,423.43
Social	12,591.69	3,380.65	14,980.77	-5,769.73
Policy Effects	-1,485.00	50.45	3,118.25	-4,653.70

Wheat

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	9,022.74	2,345.80	6,997.47	-320.53
Social	10,584.25	2,322.84	6,471.27	1,790.14
Policy Effects	-1,561.51	22.96	526.19	-2,110.67

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	10,783.27	2,362.31	7,249.40	1,171.57
Social	12,649.47	2,338.74	6,710.72	3,600.00
Policy Effects	-1,866.20	23.57	538.67	-2,428.43

Wheat, continued

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	11,443.47	2,365.08	6,808.84	2,269.55
Social	13,423.92	2,341.41	6,266.06	4,816.45
Policy Effects	-1,980.45	23.67	542.78	-2,546.90

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	9,022.74	2,354.92	6,295.37	372.44
Social	10,584.25	2,331.63	5,767.66	2,484.95
Policy Effects	-1,561.51	23.29	527.71	-2,112.51

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	11,223.41	2,364.16	6,593.53	2,265.72
Social	13,165.77	2,340.52	6,052.12	4,773.14
Policy Effects	-1,942.37	23.64	541.41	-2,507.41

Appendix 8

Small Scale Commercial Policy Analysis Matrices

Cotton 1 (average farmer practices)

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,360.53	392.71	2,789.37	1,178.46
Social	5,323.72	2,991.55	2,878.70	-546.54
Policy Effects	-963.18	-2,598.84	-89.34	1,724.99

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,687.57	397.62	2,919.41	1,370.54
Social	5,722.99	2,996.61	2,928.22	-201.83
Policy Effects	-1,035.42	-2,598.99	-8.80	1,572.37

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,469.55	394.34	2,832.72	1,242.49
Social	5,456.81	2,993.23	2,789.21	-325.63
Policy Effects	-987.26	-2,598.89	43.51	1,568.12

Cotton 2 (best farmer practices)

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	10,901.34	837.21	5,562.80	4,501.32
Social	13,309.29	778.34	5,616.32	6,914.63
Policy Effects	-2,407.95	58.87	-53.51	-2,413.31

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	10,356.27	829.02	5,346.07	4,181.18
Social	12,643.82	769.91	5,321.80	6,552.12
Policy Effects	-2,287.55	59.12	24.27	-2,370.94

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	8,503.04	801.19	4,609.15	3,092.70
Social	10,381.24	741.24	4,537.73	5,102.28
Policy Effects	-1,878.20	59.95	71.42	-2,009.58

Groundnut 1 (average farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,680.53	32.64	1,444.34	1,203.56
Social	7,442.82	33.82	1,584.65	5,824.36
Policy Effects	-4,762.28	-1.18	-140.31	-4,620.80

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,848.07	34.32	1,497.48	1,316.27
Social	7,908.00	35.55	1,637.43	6,235.02
Policy Effects	-5,059.93	-1.23	-139.95	-4,918.75

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,848.07	34.32	1,497.48	1,316.27
Social	7,908.00	35.55	1,557.93	6,314.52
Policy Effects	-5,059.93	-1.23	-60.45	-4,998.25

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,345.47	29.27	1,338.06	978.13
Social	6,512.47	30.35	1,346.57	5,135.54
Policy Effects	-4,167.00	-1.08	-8.51	-4,157.41

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,742.35	23.22	1,146.76	572.37
Social	4,837.83	24.11	1,156.54	3,657.17
Policy Effects	-3,095.49	-0.89	-9.78	-3,084.81

Groundnut 2 (best farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	8,376.67	348.79	4,148.14	3,879.74
Social	23,258.81	367.13	4,231.48	18,660.20
Policy Effects	-14,882.14	-18.34	-83.34	-14,780.46

Groundnut 2 (best farmer practices), continued

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	8,376.67	348.79	4,148.14	3,879.74
Social	23,258.81	367.13	4,231.48	18,660.20
Policy Effects	-14,882.14	-18.34	-83.34	-14,780.46

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	6,366.27	328.61	3,510.47	2,527.18
Social	17,676.70	346.35	3,518.55	13,811.80
Policy Effects	-11,310.43	-17.74	-8.07	-11,284.62

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,523.40	310.11	2,925.94	1,287.34
Social	12,559.76	327.29	2,884.90	9,347.56
Policy Effects	-8,036.36	-17.18	41.04	-8,060.22

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,020.80	305.07	2,766.53	949.20
Social	11,164.23	322.10	2,726.54	8,115.59
Policy Effects	-7,143.43	-17.03	39.98	-7,166.38

Maize 1 (average farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,876.67	345.75	2,095.83	435.08
Social	2,826.21	344.00	2,189.50	292.71
Policy Effects	50.46	1.76	-93.66	142.37

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,750.10	342.05	2,045.20	362.84
Social	2,701.86	340.19	2,139.64	222.03
Policy Effects	48.24	1.87	-94.44	140.81

Maize 1 (average farmer practices), continued

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,944.63	3,18.51	1,723.01	-96.89
Social	1,910.52	3,15.94	1,742.89	-148.31
Policy Effects	34.11	2.58	-19.88	51.42

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,093.13	293.62	1,382.40	-582.89
Social	1,073.96	290.30	1,354.51	-570.85
Policy Effects	19.17	3.33	27.89	-12.04

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	805.47	285.22	1,267.33	-747.08
Social	791.34	281.64	1,241.21	-731.51
Policy Effects	14.13	3.58	26.12	-15.57

Maize 2 (best farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,753.34	735.31	3,781.16	1,236.87
Social	5,652.42	729.61	3,802.55	1,120.27
Policy Effects	100.92	5.70	-21.39	116.61

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,523.21	728.58	3,689.10	1,105.52
Social	5,426.32	722.68	3,711.90	991.74
Policy Effects	96.88	5.90	-22.80	113.78

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,820.22	678.81	3,007.89	133.52
Social	3,753.21	671.41	2,961.65	120.16
Policy Effects	67.01	7.40	46.25	13.36

Maize 2 (best farmer practices), continued

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,082.71	628.02	2,312.87	-858.19
Social	2,046.18	619.09	2,224.29	-797.21
Policy Effects	36.53	8.93	88.58	-60.98

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,726.00	617.60	2,170.19	-1,061.78
Social	1,695.73	608.35	2,083.80	-996.42
Policy Effects	30.28	9.24	86.39	-65.36

Sorghum 1 (average farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,350.67	126.72	1,128.64	95.32
Social	561.09	125.46	1,263.17	-827.54
Policy Effects	789.58	1.26	-134.53	922.85

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	999.49	117.97	955.76	-74.24
Social	415.21	116.45	1,092.13	-793.38
Policy Effects	584.29	1.52	-136.37	719.14

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,013.00	118.31	962.41	-67.72
Social	420.82	116.80	1,019.21	-715.19
Policy Effects	592.18	1.51	-56.80	647.47

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,013.00	118.31	962.41	-67.72
Social	420.82	116.80	966.21	-662.19
Policy Effects	592.18	1.51	-3.80	594.47

Sorghum 1 (average farmer practices), continued

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,013.00	118.31	962.41	-67.72
Social	420.82	116.80	966.21	-662.19
Policy Effects	592.18	1.51	-3.80	594.47

Sorghum 2 (best farmer practices)

PAM NR 1

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	5,402.67	501.24	3,625.89	1,275.54
Social	2,244.35	498.72	3,690.56	-1,944.93
Policy Effects	3,158.32	2.52	-64.67	3,220.47

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	3,957.46	465.26	2,914.45	577.75
Social	1,643.99	461.66	2,986.67	-1,804.34
Policy Effects	2,313.47	3.60	-72.22	2,382.09

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,471.72	428.26	2,183.06	-139.60
Social	1,026.79	423.55	2,183.55	-1,580.30
Policy Effects	1,444.93	4.71	-0.49	1,440.71

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,174.58	420.86	2,036.78	-283.07
Social	903.35	415.93	1,985.82	-1,498.40
Policy Effects	1,271.22	4.94	50.96	1,215.33

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,620.80	407.07	1,764.17	-550.44
Social	673.31	401.72	1,716.11	-1,444.52
Policy Effects	947.50	5.35	48.06	894.08

Sunflower 1 (average farmer practices)

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,520.53	84.81	876.34	559.38
Social	2,362.40	83.25	1,018.39	1,260.77
Policy Effects	-841.87	1.56	-142.05	-701.39

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,463.51	83.80	854.35	525.36
Social	2,273.81	82.21	917.11	1,274.50
Policy Effects	-810.30	1.59	-62.76	-749.13

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,178.41	78.76	744.38	355.27
Social	1,830.86	77.01	755.20	998.65
Policy Effects	-652.45	1.75	-10.82	-643.38

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	1,140.40	78.09	729.72	332.60
Social	1,771.80	76.32	740.68	954.80
Policy Effects	-631.40	1.77	-10.96	-622.21

Sunflower 2 (best farmer practices)

PAM NR2

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	4,751.67	425.24	2,640.86	1,685.57
Social	7,382.51	420.63	2,721.07	4,240.81
Policy Effects	-2,630.84	4.60	-80.21	-2,555.24

PAM NR3

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,946.03	393.29	1,944.40	608.34
Social	4,577.16	387.72	1,951.82	2,237.61
Policy Effects	-1,631.12	5.57	-7.42	-1,629.27

Sunflower 2 (best farmer practices)

PAM NR4

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,508.88	385.55	1,775.79	347.54
Social	3,897.97	379.75	1,731.83	1,786.38
Policy Effects	-1,389.08	5.80	43.96	-1,438.84

PAM NR5

	Tradables		Domestic	
	Output	**Inputs**	**Resources**	**Profits**
Private	2,280.80	381.52	1,687.82	211.47
Social	3,543.60	375.59	1,644.71	1,523.30
Policy Effects	-1,262.80	5.92	43.11	-1,311.83